Report No. CG-D-13-95

U.S. Coast Guard
Marine Casualty Investigation and Reporting: Analysis and Recommendations for Improvement

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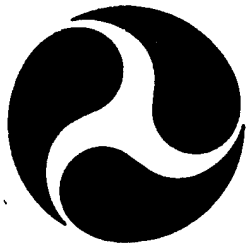

INTERIM REPORT
AUGUST 1994

Prepared for:

U.S. Department of Transportation
United States Coast Guard
Office of Engineering, Logistics, and Development
Washington, DC 20593-0001

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Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
CG-D-13-95		

4. Title and Subtitle	5. Report Date
U.S. Coast Guard Marine Casualty Investigation and Reporting: Analysis and Recommendations for Improvement	August 1994
	6. Performing Organization Code
7. Author(s) James C. Byers, Susan G. Hill, and Anita M. Rothblum	8. Performing Organization Report No. R&DC 34/94
9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Idaho National Engineering Laboratory EG&G Idaho, Inc., P. O. Box 1625 Idaho Falls, ID 83415 U. S. Coast Guard Research & Development Center 1082 Shennecossett Road Groton, CT 06340-6096	11. Contract or Grant No. MIPR No. Z51100-3-E00644
	13. Type of Report and Period Covered Interim Report
12. Sponsoring Agency Name and Address Department of Transportation U.S. Coast Guard Office of Engineering, Logistics, and Development Washington, D.C. 20593-0001	14. Sponsoring Agency Code

15. Supplementary Notes

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16. Abstract

As part of its mission to prevent and mitigate marine accidents, the U. S. Coast Guard (USCG) investigates the causes of marine casualties and analyzes investigation data in an effort to identify measures that will improve marine safety. It is estimated that 60-80% of marine casualties have human-related causes; therefore, it is important to record and analyze human errors in order to identify measures that will reduce these errors. In 1992 the USCG introduced a new casualty database, the Marine Investigations Module (MINMOD), which provided taxonomies for reporting human factors causes. The purpose of this project was to study the USCG casualty investigation process particularly with reference to the identification and reporting of human factors causes, analyze the data entry process, and make recommendations for improvements to the current computer system and the casualty investigation process.

Six Marine Safety Offices (MSOs) were visited. Twenty-four Investigating Officers (IOs) and nine Senior Investigating Officers (SIOs) were interviewed. The data analysis revealed a number of problems with the collection and entry of marine casualty data in general, and human factors data in particular. The problems were discussed in terms of the requirements for an accurate and reliable database, and suggestions were made for addressing these problems.

17. Key Words

human error
human factors
marine casualty
accident
validity
reliability
casualty investigation
casualty database
Marine Investigations Module (MINMOD)
Marine Safety Information System (MSIS)

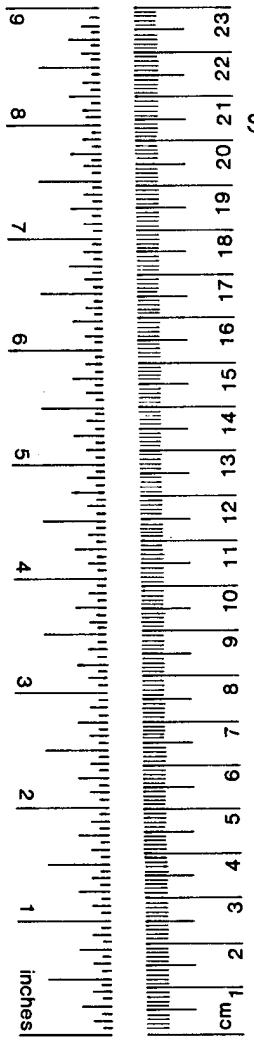
19. Security Classif. (of this report)	20. SECURITY CLASSIF. (of this page)	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIFIED		

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

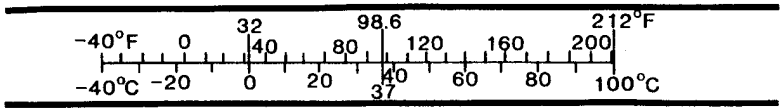
Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
in	inches	* 2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (WEIGHT)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (EXACT)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly).



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (WEIGHT)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	0.125	cups	c
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (EXACT)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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ACKNOWLEDGMENTS

The authors would like to thank LCDR Richard L. Booth, U.S. Coast Guard Headquarters, for all the help he gave in supporting the project effort; for arranging our attendance at the Investigation Department Course at RTC Yorktown; and for making the arrangements for our visits to the MSOs.

We would also like to thank all the U.S. Coast Guard personnel with whom we spoke for their professional and friendly cooperation.

Work supported by the U.S. Coast Guard Research and Development Center, under DOE Idaho Operations Office Contract DE-AC07-76ID01570.

EXECUTIVE SUMMARY

As part of its mission to prevent and mitigate marine accidents, the U. S. Coast Guard (USCG) investigates the causes of marine casualties and analyzes investigation data in an effort to identify measures that will improve marine safety. It is estimated that 60-80% of marine casualties have human-related causes (Perrow, 1984). The USCG has maintained a computer database since 1981, called CASMAIN, which summarizes the causes of investigated marine casualties; however, this database lacked the capability to classify many types of human-related causes.

In 1992 the USCG introduced a new casualty database, the Marine Investigations Module (MINMOD) of the Marine Safety Information System (MSIS), which changed the way marine casualty investigations were reported. One significant change was the introduction of detailed taxonomies for reporting human factors causes. Another notable improvement was the addition of a chain of events analysis of accident causes. There was also an organizational change that made the Investigating Officers (IOs) responsible for entering the casualty data directly into the database (instead of onto paper forms which were later entered into the computer by clerks). Given this, a system evaluation was initiated to determine what, if any, further improvements could be made to assist investigators in obtaining and entering valid and reliable casualty investigation information, particularly with reference to human-related causes. The purpose of this project was to study the USCG casualty investigation process, analyze the data entry process, and make recommendations for improvements to the current computer system and the casualty investigation process.

Background information on the USCG casualty investigation process was obtained through attendance of the first half of the Investigation Department Course given at the USCG Reserve Training Center in Yorktown, Virginia. This is the formal, three-week training course given to new IOs. The research team learned about the USCG's mission to investigate casualties, techniques for collecting evidence and interviewing witnesses, and procedures for determining root and contributing causes. Also provided in the course were hands-on opportunities to use the MINMOD for recording casualty data from practice cases.

The major part of the data collection effort entailed visits to the Investigation Departments at five Marine Safety Offices and one Marine Inspections Office (for convenience, these shall all be referred to as MSOs). Twenty-four IOs and nine Senior Investigating Officers (SIOs) and Assistant SIOs (ASIOs) were interviewed using prepared structured interview forms. Topics covered included their background in investigation, how they investigate casualties (including tasks

performed, interviewing techniques, contacts with other organizations to gather supporting information, etc.), human factors-specific data (such as their knowledge of potential human-related causes and their techniques for identifying, collecting, and reporting human factors causal data), and computer-specific data (such as what problems were encountered using MINMOD).

In order to make meaningful inferences from the data in the MINMOD, those data must be accurate (correct), reliable (consistent from investigator to investigator), and complete. Analysis of the interview data revealed a number of problems with the collection and entry of marine casualty data in general, and human factors data in particular. In the case of the human factors data, the problems were substantive; we conclude that *much of the human factors data in the MINMOD is inaccurate, unreliable, and incomplete*. Therefore, analyses of the human factors causal data in the MINMOD should be considered as uncertain and should not be used as the basis for regulatory decision-making.

In order to understand these problems and identify solutions, a framework was developed within which we could categorize different aspects of the data collection and entry process. This framework consists of six steps or requirements which influence the accuracy, reliability, and completeness of the data in any database. These six steps are discussed below.

(1) *Establish the purpose and scope of the database*. One must first determine the goals of the database and develop data collection requirements to meet those goals. The purpose and scope must be understood by those who collect and code the data. Policy must be set which clearly stresses the level of detail required for different types of casualties and the level of expertise required of the data collectors under different casualty situations. This study found that field personnel have a limited (if any) understanding of why USCG Headquarters wants them to collect and enter much of the data requested by MINMOD. They view many of the data requests as excessive and of little or no value. Without an understanding of the scope and purpose of the MINMOD, it is also difficult to successfully carry out the following steps for achieving a valid, reliable, and complete database.

(2) *Collect valid and reliable data.* In order for the data to be valid (accurate, true), a complete investigation is needed to uncover all the facts. This implies the need for first-hand, on-scene investigation and timely interviews of witnesses while the casualty events are still "fresh" in their memories. The study found that due to: (a) lags between the occurrence of a casualty and USCG notification of the casualty, (b) the time required to perform on-scene investigations, and (c) the logistics of getting to the scene, few casualties are actually investigated on-scene or in a timely

manner. In addition, the conflict between the "investigator" and "enforcer" aspects of an IO's job probably causes many of those being investigated to be less than fully forthcoming in their depiction of the accident.

In order for the data to be reliable (consistent across investigators), all the investigators must use the same techniques and procedures in collecting data. The study found that IOs do not use any standard set of procedures or checklists; methods vary from IO to IO, and from MSO to MSO. This increases the probability that different investigators will focus on different aspects of the investigation or use different strategies for deciding what types of data to collect, leading to inconsistencies (unreliability) in the data reported in the MINMOD.

(3) *Determine the human-related causes of accidents.* In order to determine human factors causes, the investigator must understand what "human factors" is, and be able to identify the myriad types of human error and how these chain together to cause a given casualty. The study found that IOs have little or no training in human factors. Accordingly, their explanations of human error tended to be narrow and overly simplistic. This lack of training severely limits the IOs' capability to identify human factors causes of casualties, and negatively impacts the validity of the human factors causal data in the MINMOD.

(4) *Employ a taxonomy which adequately represents the causes and contributing factors.* The taxonomy is the tool which translates accident data into a meaningful set of codes which, in turn, directly supports the statistical analyses required to achieve the goals of the database. The taxonomy must cover the entire range of information needed for analysis and must be structured such that it is non-redundant, allows for levels of detail appropriate to the type of investigation, is well-defined, and is easy to use and understand. The study found that IOs consider the human factors taxonomies in the MCDD and MCHF product sets in MINMOD to be confusing and difficult to use. The terms are undefined and the structure is redundant and inconsistent in intent and level of detail. The taxonomy is also directed at a level of human factors expertise which far exceeds that imparted to IOs via the Investigation Department Course.

(5) *Correctly and efficiently enter data into the database.* The database system should be designed for ease of use and efficiency in the entry of casualty data. The MINMOD was seemingly designed without benefit of the wealth of knowledge available on human-computer interface design. The result is an awkward, tedious (one IO even said user-hostile) system that is so difficult and time-consuming to use that it discourages IOs from spending the time required to enter a complete account of a case; instead some enter the bare minimum of data. This has an obvious negative

impact on the completeness of the data within the MINMOD. The lack of user documentation and the lack of context-specific help screens cause inconsistent and invalid data code entries. Poor screen design and inconsistent use of terminology and abbreviations within the MINMOD software promote user errors. The result is a database system which interferes with the accurate, reliable, and complete entry of the data it was designed to collect.

(6) *Use the database as a means for feedback.* The needs of the USCG Headquarters analysts were beyond the scope of this project, however an area of interest was the MSO use of, or feedback to the MSO from, the MINMOD database. Ideally, a casualty database should be a two-way street: it should provide a structure for the collection and entry of data, and it should be available to the data collectors so that data analyses can be performed and the results of those analyses used to improve or focus future investigations. Individuals have a much greater stake in the quality of the data input if they are also users of the data output. This study found that the MSOs receive little or no feedback regarding the use or value of the casualty data they collect. The MSOs are not able to perform data analyses themselves, even though they recognize the benefit of doing so.

As discussed above, this study found the USCG has many problems in the collection and entry of human factors causal data into the MINMOD database. There are many opportunities for improvement, and recommendations are given in Sections 4 and 5 of this report. It is important to recognize that the problems are pervasive; that is, they affect every step of the framework described above. Therefore, a "quick fix" targeted at only one step (e.g., development of a new human factors taxonomy) will not make the data accurate, reliable, and complete. The entire investigation process, as it relates to human factors causes, must be reassessed, starting with the purpose and scope of the database. Once the goals and objectives of collecting human-related causal data are determined, the remaining five steps must be evaluated in light of these goals. Such a "top-to-bottom" reassessment of the entire framework will allow the Coast Guard to restore integrity to its human-related causal data in the MINMOD. Only then will the MINMOD be able to support marine safety goals (such as those in the 1994 G-M Business Plan) by providing high-quality data which can be used to understand the magnitude of human factors safety problems and help to focus efforts to combat those problems.

1. INTRODUCTION

One of the missions of the U. S. Coast Guard (USCG) is to protect the public, the marine environment, and U. S. economic interests through the prevention and mitigation of marine accidents. One of the means used to accomplish this task is to investigate the causes of marine casualties and to use this information to improve marine safety. It is estimated that 60-80% [1] of marine casualties have human-related causes. In 1992 the USCG introduced a new casualty database, the Marine Investigations Module (MINMOD) of the Marine Safety Information System (MSIS), which changed the way marine casualty investigations were reported. The new system included a chain of events analysis of accident causes and detailed taxonomies for reporting human factors causes. Feedback from field units indicated that there was a great deal of confusion and frustration over the use of the human factors taxonomies in the MINMOD. Interviews with Investigating Officers (IOs) indicated that they were not confident of their abilities to identify and report human factors causes of accidents. The present study was undertaken to determine how Investigating Officers investigate and report human factors-related casualties, and to document any problems they have with the MINMOD.

1.1 The History Behind This Project

The United States Code, 46 USC 6301 [2], grants the U. S. Coast Guard the authority to investigate marine casualties. According to the *Marine Safety Manual* (Volume V, 3.A.2)[3]:

> An important purpose of marine casualty investigations is to obtain information for the prevention of similar casualties, as far as practicable. It is necessary for the causes of casualties to be determined as precisely as possible so that factual information will be available for program review and statistical studies. It is not sufficient to know only how a casualty occurred; it must also be clear why it happened....In many cases, human factors that are not readily apparent are the underlying causes of casualties.

In 1981 the Coast Guard's Marine Investigation Division (G-MMI) established the CASMAIN database for the reporting and analysis of casualty data[4]. CASMAIN was the Coast Guard's first structured approach to collecting data on all serious marine casualties. The database enabled the USCG to provide statistical analyses of causal data.

In 1992, CASMAIN was replaced by the MINMOD. One of the major improvements in the MINMOD was the capability to consider the chain of events which led to a casualty and the causes

of each event. This allowed a more complete description of the casualty and its multiple causes, and more readily aided in the assessment of "why" a casualty occurred.

A second major improvement in the MINMOD was a more complete taxonomy of human factors causes provided in the Human Factors Supplement (MCHF). As noted in the *Marine Safety Manual* as well as in studies of accidents[1, 3, 5, 6], human factors contribute to many casualties (60%-80% is commonly cited). Therefore an adequate taxonomy to capture the many types of human error is critical to understanding "how" and "why" an accident happened. The taxonomy used in the MINMOD was derived, at least in part, from a G-MMI review of some existing human factors accident taxonomies. It was hoped that the taxonomy would allow the Coast Guard to better track human-related causes of marine accidents.

Soon after the MINMOD went "on-line," special MINMOD courses were presented in order to train at least one member from the Investigation Department at each Marine Safety Office (MSO) and Marine Inspection Office (MIO)*. Also, since the focus on human factors was relatively new, lecture materials were prepared on human factors for inclusion into the Investigation Department Course taught to new Investigating Officers at the Reserve Training Center in Yorktown, Virginia (RTC Yorktown).

Field personnel encountered many difficulties with the MINMOD[7-10]. Major complaints included: completing reports in MINMOD took more time - double or triple the time required by the previous system; MINMOD had an unfriendly user interface; MINMOD requested an excessive amount of data; and MINMOD had ambiguous or ill-defined codes. Subsequent interviews with members from two MSOs substantiated these complaints[11].

Because of the new emphasis on human factors causes of casualties, G-MMI was interested in determining whether the human factors data entered into the MINMOD were correct and complete. Interviews were conducted with personnel from two MSOs[11]. The IOs indicated they were not confident of their abilities to identify and report human factors causes of accidents. Further, they reported having a poor understanding of the human factors codes in the MINMOD. They also had little confidence that the human factors data in the MINMOD were accurate. Their reasons for this included lack of training in human factors, lack of a user guide which defined the codes, and an inability, in some cases, to find a code which appeared to be suitable for the given situation.

* For convenience, the acronym "MSO" will be used hereafter to refer to both MSOs and MIOs, except where indicated.

Based on this limited review, it was apparent that the human factors data in the MINMOD were neither correct nor complete. It was also apparent that the problems with the MINMOD were broader than the human factors taxonomy. Therefore the current project focused on two areas. The first was an analysis of the way the Coast Guard investigates and reports human factors causes of marine casualties. The second was an analysis of the user interface of the MINMOD.

1.2 Human Factors Related Causes of Casualties

To fully understand this study and the resulting conclusions and recommendation, some background information is needed on the field of human factors and its relationship to causes of casualties.

Human Factors Engineering is concerned with the design, development and evaluation of systems, so that these systems can be operated and maintained at their optimum performance level. Human factors is concerned with the interactions between people and machines, between people and the environment, and among people. A critical aspect of human factors is to understand the capabilities and limitations of people, so that processes and equipment can be designed to take advantage of human abilities and accommodate weaknesses in human performance. Systems designed without consideration of human performance (i.e., capabilities and limitations) promote human error.

Human-related causes of accidents is an area of increasing interest, particularly in areas which use complex technology. Organizations such as the U.S. Army, U.S. Air Force, U.S. Navy, U.S. Nuclear Regulatory Commission, U.S. Federal Railroad Administration, and the U.S. Department of Energy all have investigation processes that attempt to capture information about accidents [12-17]. These processes have differing levels of specificity regarding information about human-related causes of accidents, but all attempt to address this important aspect.

As stated earlier, 60-80% of marine casualties are estimated to have human-related causes associated with them. An important aspect of this statement is that casualties have multiple causes, resulting in a chain of events [1, 5, 18]. Human-related causes of marine casualties can occur in ship design, manufacture, operation, maintenance, or management. For instance, errors that occur in ship design may lay dormant for years, until a confluence of events brings the design error to the fore where it becomes a critical element of the causal chain of events. Such a factor, laying in wait, has been termed a "latent error," as opposed to an active error that occurs during operations [19].

The Torrey Canyon accident provides an example of how a series of different types of human error contributed to a grounding and the resulting spill of 100,000 tons of oil [1]. First there was **management pressure** to stay on schedule: the master needed to reach the entrance to the Milford Haven oil terminal at high tide that day or risk having to wait three or four days for the next sufficiently high tide to enter the terminal. The master also needed to transfer cargo to even out the ship's draft. He could have done it while underway, but his **vanity** about his ship's appearance caused him to plan to stop before entering the terminal and perform the transfer in sheltered waters. The additional time needed at Milford Haven to perform the transfer compounded the time pressure and led to the master's **poor decision** to go through the Scilly Islands (instead of around them) in order to save time. Finally, the **poor design** of the autopilot system contributed to the helmsman's wrong assumption that the steering selector was on "manual," when in fact is was on "auto" and unresponsive to his attempt to avoid the grounding. If any one of this series of human errors had not occurred, the grounding and oil spill probably would have been avoided.

The value of accurate data on the human factors-related causes of casualties is clear. If 60-80% of casualties have human-related causes, then by identifying and understanding the causes, and the chain of events in which they occur, progress in prevention of 60-80% of the casualties can be made. If trends and problems can be identified, then appropriate actions, such as issuing information and guidance, increasing inspections or investigations, or issuing new regulations, can be taken. It is critical to understand, however, that human factors data are not just data related to mariners making active, operational mistakes. Human factors data relates to both latent and active failures that make up the chain of events leading to the casualty. People are often "set up" to make errors, and by identification and prevention of such "set ups," the chain of events may be broken, and casualties avoided or consequences reduced.

1.3 The Purpose Of This Project

The purpose of this study was to examine the USCG casualty investigation process, analyze the present casualty data entry process, draw conclusions and recommend changes which would enhance the collection and entry of casualty data, specifically human factors data, in a logical, user-friendly manner, and would ensure that the entered data are reliable, accurate, and complete.

1.4 The Scope Of This Project

The focus of this study is on the Investigating Officers and the Investigation Departments in which they work. The Investigating Officers collect and enter casualty data into the MINMOD database. Therefore, the focus is on the generation and input of data, not on the ultimate use or analysis of the data. Although it is clear that these latter activities are important and deserve considerable attention, these activities were beyond the scope of the current study. This study did not focus on software programming activities and data analysis activities which take place outside of the operational field unit (e.g., such as those at USCG Headquarters).

Of particular interest for this study were marine casualties, rather than personnel actions or marine violations. With prevention of marine casualties as the goal, human factors causes and contributing factors which are identified fully may provide information on areas where prevention strategies may pay off. Although the focus of this study is on marine casualties, mention of the other case types (e.g., personnel actions) will be found. To the investigator, many of the processes (including the basics of the computer database interface) used are the same, regardless of case type. It is also true, that while marine casualties are of greatest interest for this project, the other case types occupy a considerable amount of the investigators' time and attention. Thus it was determined that while marine casualties would be the focus, relevant information related to the other case types would be included in the report as appropriate.

It is assumed that the reader has some familiarity with USCG marine safety activity and USCG policy and procedure. Some background information on marine safety, Investigating Officer tasks, and the field of human factors is given, however, it was not within the scope of this project to evaluate marine safety activities. There are some discussions related to USCG policy and procedures; it is not the intent, nor would it be appropriate, for this study to evaluate and make recommendations on policy. These discussions focus on the effect of policy on the performance of the investigators, rather than on the specific policies themselves.

In summary, the scope of this study entails obtaining information from, and observing the activities of, Investigating Officers in Marine Safety Offices. The activities that IOs perform are analyzed. The impact of the investigation process on the IOs' performance is also analyzed.

1.5 Organization Of This Report

This report is organized into 5 sections. The first two sections provide introductory and methodological information regarding the purpose of the study and how it was carried out. Section 3 presents background information about Investigating Officer demographics, IO duties and job activities, and an overview of human factors information relevant to casualty investigation. Section 4 presents the primary results of the study. These results are presented in an analysis of the requirements for a valid and reliable database of casualty data. Finally, Section 5 provides a summary and recommendations for improvement based on the study results. Appendices contain additional information, including data collection forms, tables of collected data, verbatim comments from interviews, and a list of acronyms.

2. METHODOLOGY

The method used to complete this study can be identified in terms of three major activities. These activities were:

- collect background information.
- plan and execute USCG operational field unit data collection.
- evaluate the human-computer interface of the computer system (i.e., MINMOD).

Each activity is described in the discussions below. The last subsection of this section gives a brief summary of what data were collected.

2.1 Collect Background Information

A good starting place from which to collect background information about the USCG casualty investigation process is the school where Investigating Officers are trained. Therefore, the study team attended (or viewed on videotape) the first eight days of the fifteen-day Investigation Department Course (MS472R), given during the summer of 1993 at the Reserve Training Center, Yorktown, Virginia. The first eight days included lectures on basic investigation skills and topics relating specifically to federal law, regulations, and Coast Guard policy. As part of the training, students were introduced to the Marine Investigation Module (MINMOD) of the Marine Safety Information System (MSIS). Actual system interaction experience was gained using the training portion (F-Train) of the on-line computer system.

The information that was gained from the IO training course served as the baseline for understanding both the IO's tasks and the MINMOD data entry system. Other relevant material, such as information on human error and other organizations' methods and requirements for obtaining human factors data related to accidents, were reviewed for background.

2.2 Collect Field Unit Data

The purpose of this study was to understand the U.S. Coast Guard marine casualty investigation process, how that process relates to the current computer database system used to report the investigation results, and identify how the process and computer system might be improved. In

order to best fulfill this purpose, it was clear that obtaining information on these topics directly from the individuals performing the tasks was of prime importance. Therefore, materials for gathering information of interest were developed, and plans for visits to Investigation Departments at USCG MSOs were made.

2.2.1 Structured Interviews

Primary information about what the Investigating Officers thought and did during investigating and reporting was obtained via structured interviews with the IOs, the Senior Investigating Officers (SIOs), and others who may be a part of, or interact with, the Investigation Department in their investigations of marine casualties. Structured interviews consist of specific, pre-determined questions which are asked of the interviewees, in this case, the IOs, SIOs, or others. The structured interview questions focused on four areas:

- personal data (e.g., training and experience)
- job, task, and organizational data (e.g., tasks performed, other organizations with which the IOs interact)
- human factors-specific data (e.g., specifics of human factors data collection during investigation)
- computer system-specific data (e.g., what problems do you have with the MINMOD data entry system).

Structured interview questions were developed for IOs and for SIOs. The majority of the questions were the same for the two interview types, although there were additional questions for the SIO that dealt with managerial responsibilities such as case assignment and quality control. Separate structured interview questions were developed for pollution investigators on their use of MINMOD and on how they interact with the Investigation Department. Pollution investigation was not a focus of this study, and pollution investigators were only interviewed as time permitted.

The structured interview questions were reviewed for clarity and completeness. They were used at the first MSO visit. Afterward, some additional questions were added and the forms revised. The revised structured interview questions used for the other five data collection visits are given in Appendix A.

2.2.2 Task and Computer Use Data

Additional material for collecting task and computer use data was developed and is also presented in Appendix A. An observation time study approach was used. As time permitted, the data

collector would observe the IOs in their jobs, noting what they did and how long it took. Of particular interest was how the IOs interacted with the computer system, hence the data collection form was set up to enable tracking of which MINMOD product sets were used and how often various software functions were used.

2.2.3 MSO visits

Six MSOs were visited to obtain data for this study. The six sites and dates of visits are given in Table 1. The MSOs were chosen in concert with G-MMI-3 recommendations, based largely on geographical location and department size. As can be seen, two MSOs were visited on the west coast, two on the east coast, and two on the gulf coast of the Continental U.S. Size was a factor in that visits were planned to locations that had more IOs so that interview data from as many different individuals as possible could be collected. During the planning process, information on the percentage of marine casualty cases reported with human factors causes was reviewed. Although percentages differed among MSOs, the differences were not so great as to become the overriding consideration in choosing visit sites. An attempt was made to visit MSOs with large numbers of cases and differing percentages of cases with human factors causes. No Marine Safety Detachments (MSDs) were visited.

Table 1. MSOs visited and visit dates.

MSO	Visit Dates
MSO Puget Sound, WA	September 14-16, 1993
MSO New Orleans, LA	October 18-20, 1993
MSO Morgan City, LA	October 21-22, 1993
MSO Baltimore, MD	October 25-27, 1993
MSO/Group Los Angeles/Long Beach, CA	October 25-27, 1993
MIO New York , NY	November 2-4, 1993

After choosing the MSOs to be visited, letters were sent from USCG Headquarters (G-MMI-3) requesting cooperation for this study. Specific visit plans were coordinated between the data collector and the Investigation Department point of contact. Three data collectors (two from the Idaho National Engineering Laboratory and one from the USCG Research and Development Center) each visited two of the MSOs. Each visit lasted 2-3 days. During the visit, the data

collector interviewed the SIO, Assistant SIO (if the MSO had one), and as many IOs as were available, or that time permitted. Interviews were extensive, lasting an average of 2.5 hours; even at that length, not all questions were answered by all individuals. IOs' task and computer activities were observed. If time permitted, other personnel were interviewed.

Data collectors had planned to accompany IOs on field investigations, but no such field visits were made because of lack of occurrence/opportunity while at the MSOs.

2.2.4 Data Handling

Upon completion of the data collection, the structured interview data were compiled in a database (using Double Helix, version 3.5)[20] for ease of manipulation.

2.3 Evaluate Human-Computer Interface

A third part of the study involved the evaluation of the human-computer interface (HCI) of the MINMOD computer system. The human-computer interface encompasses all the ways in which the user interacts with the computer system, including everything displayed on the computer screen, and all actions and information required from the user.

There are a number of design principles and design guidelines available that address the human-computer interface[21-23]. The underlying principle is that the interface design will determine, to a great extent, the ease with which a user can interact with the computer. If the interface is poor, users will have difficulty in using the system. Such difficulty can result in decreased productivity and increased error and user frustration.

In addition to obtaining specific information about the MINMOD human-computer interface from the structured interviews, an evaluation of the computer displays was performed. The evaluation compared the current computer system with human factors design principles and guidelines.

2.4 Summary of Data Collected

The six visits included interviews with a total of 24 IOs and 9 SIO/ASIOs. The positions of those interviewed are presented in Appendix B, Table 1. The results of the interviews are presented in Sections 3 and 4. The observed task and computer data were reviewed; all results support the

interview data, that is, there were no conflicting data between what was reported by the IOs and what was observed during IO task performance. Therefore, the task data are not reported separately.

As the results of the study are read, it is important to keep in mind that not all IOs answered all questions. Therefore, different numbers of individuals answered each question, with that number sometimes being very small. It is believed that all the data collected are valuable; comments and observations reported by one individual are important in identifying areas for system improvements. However, any statistics presented are intended for descriptive purposes only and are not meant to imply any statistical significance.

3. BACKGROUND INFORMATION

3.1 Marine Safety

The philosophy and origins of the USCG Marine Safety Program are laid out in the Volume 1 of the *Marine Safety Manual* [16], which is the "primary policy and procedural statement for the marine safety programs of the Coast Guard." Volume I of the *Marine Safety Manual* presents an overview of the Marine Safety Program as well as administration and management information related to the USCG program. Volume I of the *Marine Safety Manual* also states that "present law at 46 U.S.C. Chapter 63 ... requires investigation to determine the cause of the casualty as well as matters relating to personnel fault." Volume V of the *Marine Safety Manual* [3] is devoted to policies and procedures related to marine investigations.

The purpose of this study was to examine the USCG casualty investigation process for vessel casualties (excluding pollution-only cases), particularly with regards to the use of MINMOD, and identify areas for systems improvements with a focus on the collection and reporting of human factors data. As part of this study, it is important to understand who the IOs are and what tasks they perform. This background information presents the context in which to understand and evaluate the material discussed in detail in Section 4 of this report.

3.2 High Level Description of USCG Casualty Investigation and Reporting

Marine Safety Offices have the primary mission of promoting marine safety. Although each MSO is organized somewhat differently, generally, MSOs are organized into several departments, including the Port Operations, Inspection, Investigation, and Administration Departments. Other functions that may be associated with MSOs are Regional Exam Centers (REC), licensing and documentation, Marine Safety Detachments and Vessel Traffic Service (VTS).

The Investigation Department is staffed with Investigating Officers (IOs). The Senior Investigating Officer (SIO) is the head of the department and as such is responsible for the management of the department. Since many Investigation Departments have only two members (the SIO and the IO), the SIO will investigate cases as well. In large departments there may be an Assistant SIO (ASIO). IOs are usually active duty military personnel, but may also be civilian USCG employees. In some offices, USCG reservists serve their required duty assisting in the

Investigation Department. Other military and civilian personnel may work in the Investigation Department, often in administrative functions.

Primary duties of the IOs include investigation as a "means to promote safety of life and property and to protect the marine environment" [3]. Investigations may be conducted for "vessel casualties or accidents; violations of statutes the Coast Guard is authorized to enforce; incidents involving vessel personnel that may lead to suspension and revocation (S&R) proceedings or assessment of civil or criminal penalties; boating accidents; waterfront facility casualties and incidents; deep water port casualties and incidents; marine pollution incidents; accidents involving aids to navigation; and accidents involving structures on the outer continental shelf" [3].

Specific information on how to carry out investigations is contained in the *Marine Safety Manual*, Vol. V [3]. The Investigation Department may be notified of a marine casualty by a number of means, telephone and a Form CG-2692 being the two primary means. The Form CG-2692 is used to report vessel casualties, losses of life, and injuries, and is required to be submitted if the casualty or other incident meets certain criteria. Prior to the introduction of MINMOD, investigation results for marine casualty (MC) cases included the CG-2692, a narrative report (as needed), and other supporting information and letters (as needed), and were submitted to USCG Headquarters (G-MMI). Coding of the submitted reports for the CASMAIN database was done by G-MMI. MINMOD now replaces the need for the investigation results to be submitted on paper and moves the casualty report coding away from USCG Headquarters, back to the IO who conducted the case and is most familiar with the case.

As a marine casualty is investigated, personnel actions (PA cases) and marine violations (MV cases) may be identified and pursued. The investigation of PA and MV cases are separate from the investigation of marine casualties. However, PA and MV cases are also identified through means other than as a result of MC cases (e.g., mariner drug use cases). The PA and MV cases, which result from violations of statutes and regulations enforced by the Coast Guard, may result in hearings. The hearings can result in civil penalties against the person or administrative proceedings against licenses, mariners' documents or Certificates of Registry issued by the Coast Guard.

The IOs in Investigation Departments may perform other functions. Any requests for Coast Guard information may be handled by the Investigation Department, including requests for information under the Freedom of Information Act (FOIA). Some proactive investigation (not associated with a case) is done, including "undercover" activities, such as dressing and acting like

a tourist to observe tour boat activities. The Investigation Department interacts as needed with the other MSO departments, for example, to assist in investigation of pollution incidents.

3.3 Investigating Officer Characteristics

As part of the interviews conducted with SIO/ASIOs and IOs at MSOs, personal data related to age, rank, training and experience were collected. These data specifically describe the personnel who were interviewed, but more generally give information about the characteristics of USCG Investigation Department personnel as a whole. This is based on the assumption that the Investigating Officers that were interviewed were representative of all USCG Investigating Officers. The average age of SIO/ASIOs who were interviewed was 39 years; the IOs' average age was 31 years. Average time in the USCG was 16.5 years for SIO/ASIOs and 8 years for IOs. The SIO/ASIOs had been in their current jobs slightly longer than the IOs (16 months vs. 12 months). It should be noted that only 5 out of 9 SIO/ASIOs and 3 out of 24 IOs reported any previous investigation experience at all. The majority had no previous investigation experience.

Of the total 33 IOs and SIO/ASIOs interviewed, 24 had attended the Investigation Department Course taught at RTC Yorktown (or an earlier equivalent course). Twenty-three of the 24 who had attended responded to the question "How much time did you spend as an IO before attending the IO Course?" The average time was 3 months, with a range of 0 to 12 months. Detailed data are given in Appendix B, Table 2.

It is important to note that the IOs who participated in this study were observed to be very professional, hardworking, and committed to doing the best job possible. Therefore, the results of this study should be considered in the context that IOs are professionals willing to learn and do what is requested, if they know what is desired and are given adequate tools and resources.

3.4 IO Tasks

Another important aspect for background is to understand what tasks an IO performs. Understanding the IOs' tasks provides a perspective on the breadth of required tasks of IOs, and the time requirements of the tasks. The data reported resulted from the interviews, so that these data represent the IOs' perspective of their tasks, supported by the observations of the researchers/interviewers.

When the IOs (and SIO/ASIOs) were asked the question, "What are your (the IO's) five primary job activities and what percentage of your time do you spend on each?," their answers to this question were quite diverse. What one IO thought about his job was not necessarily what another IO thought about it. In talking about their jobs, the IOs overall described 4 basic classifications of job activities: investigation, computer entry, collateral duties, and training. The primary of these is, of course, investigation. Out of 149 job activities given (not all 31 IOs who provided job activities provided 5), 100 were investigation activities. The other 3 basic classifications are: computer entry, 23 out of 149; collateral duties, 16 out of 149; and training, 10 out of 149.

In addition, the IOs were asked to estimate the percentage of time they spent on the various job activities. Computer entry, which could be thought of as a part of investigation, is broken out because of the large amount of time the IOs said they spent on it. The greatest percentage of reported time is spent on investigation activities, with about twice the time spent on investigation as on computer entry. A lesser amount of time was spent on collateral duties and training (each about one-half the time spent on computer entry). Detailed data are given in Appendix B, Table 3.

Although the percentage of time spent is relative, and is self-reported, it is remarkable that of the time spent on investigating and reporting the results via an automated computer system, one-third of that time is spent on data entry. At the very least, this suggests that the computer is a very important, indeed critical, tool of the IO's job. Another interpretation is that the computer data entry process is inefficient and wastes time (as discussed in detail in Section 4.5).

IO descriptions of investigation activities generally fell into two categories: task description and case type description. The IOs who provided task descriptions listed investigation task activities (e.g., interviews, research applicable laws and regulations, trying to track people, drawing conclusions, collecting evidence, litigation, beeper duty, reviewing log books, etc.). The IOs who provided case type descriptions listed case type activities (e.g., Personnel Action [PA] investigations, investigating Marine Casualties [MC], fire investigations, Marine Violation [MV] cases, Suspension & Revocation [S&R], boating accidents, drug cases, etc.).

Not only are the job activities which an IO performs of interest, but also of interest are how the IOs organize those activities in their day-by-day work. Therefore, during the interviews the IOs were asked to describe a typical day as an IO. The full text of the IOs' responses may be found in Appendix C. A basic description of the typical IO day is a day spent in the office, processing information. Information comes in to the IO via paper, phone, radio, computer, and word of

mouth (e.g., conversation with other IOs or other Coast Guard personnel). The IO sends out information by phone, letter, computer, and word of mouth. IOs deal daily with two types of information: (1) information specific to cases that are being investigated (e.g., a CG-2692, a logbook, a deposition, a record of a telephone call) and (2) information about how to process the information in (1) (e.g., Marine Safety Manual [MSM], Code of Federal Regulations [CFRs], U.S. Code [USC], MINMOD guidance). It is not typical for the IO to leave the office during the day (except perhaps for lunch). Typically, more than one case is worked on in the course of a day, time is spent on the telephone each day, and time is spent on the computer each day.

Of particular interest are the time requirements related to IO job activities. A common statement heard (including prior to the beginning of this study) is that the case load of IOs is large, suggesting that time constraints play an important role in how work is accomplished. Therefore, IOs were asked about their case loads. The average number of open cases at the time of the interviews was 26 cases (with a range of 5-56 cases). The most cases the IOs had open at any time during the past six months (or however long they had been an IO, if less than six months) was an average 32 cases (with a range of 6-63). The fewest cases they had open at any time during the past six months was 15 cases (with a range of 0-50). The average number of new cases assigned per week was approximately 3 new cases. Detailed data are given in Appendix B, Table 4.

IOs (especially the newer IOs) sometimes complained about having a large number of open cases to manage. However, when the IOs were asked whether the average time they spent on cases was enough time to do their job well, only 3 out of 20 responded "No" (not enough time to do job well). Of those three, one said that the time per case required a "minimalist approach" (suggesting that one could always use more time on any case), another said he needed 4 more hours per case, and the third said he needed one more hour per case.

There was a large difference in case load among individuals, mainly due to level of experience (new IOs had fewer cases) or type of case (a specialist in hearings might have fewer cases than an IO doing only MC cases).

An apparent difference in case load was also noticed among the MSOs visited. The reported average case load per person ranged from approximately 14 cases (in MSO New Orleans) to approximately 52 cases (in MSO Morgan City), with others MSOs having an approximate average of 20-25 cases per person (see Table 5, Appendix B). These differences should be viewed with caution as not all personnel in every MSO were interviewed (in some only a small sample of IOs

was interviewed), case types vary with geography, and number of cases does not always correlate with complexity of cases.

The IOs were also asked how many hours they worked per week. The average was 42.6 hours for the 19 IOs responding, with a range from 40-50 hours per week.

As noted previously, most of the IOs attended the USCG Investigation Department Course. The three-week (when most took it) training course included material on U.S. law and USCG regulation, investigative techniques such as interviewing and obtaining physical evidence, and exercises involving performing mock interviews and preparing cases, culminating in a hearing before an actual Administrative Law Judge. The IOs who had attended the IO course were asked how their jobs differed from what they were taught at the course. The complete answers to this question are found in Appendix D. The general tone of the responses was that the IO training course was more idealistic and more simplistic than actual investigations. There was also a feeling that the IO course only touched on the basics, and even then was only an introduction. Please note that this study did not intend to evaluate specifically the Investigation Department Course, but was only interested in the IO's perspectives of the course as it related to actual IO experience.

Investigating Officers communicate and interact with a number of different people and organizations. They communicate outside of the Coast Guard with individual mariners, lawyers, shipping organization representatives, classification organizations and others. Within the Coast Guard, IOs communicate within their own MSOs for information (e.g., inspection expertise, how to investigate a particular type of case, records information). They also have interaction with IOs in other MSOs (e.g., sharing personnel and vessel information, resolving jurisdiction issues). Interview data related to differences among MSOs can be found in Appendix D.

4. REQUIREMENTS FOR A VALID AND RELIABLE CASUALTY DATABASE

In this section, a model containing six requirements for a valid and reliable casualty database are suggested. The term "requirements" suggests that these are necessary conditions to obtain information that will serve the ultimate objectives of the organization, but these could as easily be called steps. The term step implies a sequence; this is appropriate. Each step impacts, to some degree, the ability to successfully complete the following steps. The sequential nature is even more apparent in the *iterative* nature of the model. Results from the last step, "feedback," are used in the first step, "establishing purpose and scope." It is also true that these conditions are somewhat idealized; in the real world it is rare that all requirements are fully realized, and that the iterative process (as explained in the following discussion) is used to the maximum extent possible. But, the extent to which these requirements are not fulfilled will impact the degree to which the ultimate objectives are fulfilled. If any of these requirements are not met, the validity and reliability of the database is degraded.

The two characteristics of "validity" and "reliability" are instrumental to a useful and good database. Validity refers to the characteristic of truth. Does the casualty database contain data that reflect the truth of what happened? Any database can contain enormous amounts of data, but if the data are not valid, if the data do not correspond to what actually happened, then the database is invalid and therefore not useful in describing the true state of affairs or in solving real problems. Reliability refers to the characteristics of repeatability and obtaining uniform data across data gatherers and coders. High reliability ensures that the data obtained and input in the database do not depend on individual capabilities and personalities, but will be the same regardless of the people involved. Reliability reflects the consistency with which data are obtained and input. Validity and reliability are not the same, but both characteristics are desired and required for an accurate and consistent database. For example, two people can be very consistent (reliable) with each other in data input, but both sets of input may contain inaccuracies (invalid). Similarly, two people can obtain accurate, true data (valid), but assign different codes to the same accurate data (unreliable).

There are a number of steps needed to achieve a valid and reliable database. Six such steps are listed and described below. These steps are not intended to be comprehensive and exclusive; certainly others could argue other breakdowns of database requirements. Instead, these six requirements are intended to illustrate a sequence of events and a list of criteria useful in examining

databases in general, and the current state of the USCG marine casualty database (i.e., MINMOD) in particular.

The six steps are:

1. Establish the purpose and scope of the database (particularly with regards to human factors-related data);
2. Collect valid and reliable data;
3. Identify and classify human-related causes of accidents;
4. Use a taxonomy which adequately represents the causes and contributing factors;
5. Correctly and efficiently enter data into database;
6. Use the database as a means for feedback.

These steps constitute a "model" of a casualty database of accurate and reliable data, useful to and used by appropriate personnel to fulfill the marine safety mission of the USCG. The degree to which these steps are fulfilled (or not fulfilled) will impact the degree to which the performance by IOs in accomplishing their jobs will be enhanced (or degraded). It is very important to point out that the perspective covered in this report is that of the IOs in the field organizations. Detailed data were collected via interview and observation. The scope did not include consideration of other individuals and organizations outside of the Investigation Department; specifically the scope did not include consideration of Headquarters tasks and personnel.

Each step is discussed in three separate ways below. First, a description of what is "ideally" entailed in the step, and its importance in producing a valid and reliable database, are given. Next, observations are presented on how the USCG casualty investigation process and the computer database system (MINMOD) meet the requirement. The focus of the observations are on human factors-related casualty data, but are not meant to exclude other casualty data. Finally, based on the observations, conclusions and recommendations are presented.

4.1 Establish the purpose and scope of the database (particularly with regards to human factors-related data)

4.1.1 Ideal

The first requirement is to identify and understand what areas are of concern in the database. This requirement establishes the purpose and scope of the database. Why have a database? What will it

be used for? What questions will be asked of it? What areas should be covered and in what detail? Such issues are management issues, and it is not the intention of this report to answer these types of policy questions. However, it is critical to understand that however these questions are answered, the degree to which this information is communicated to those working to collect and input data will very much impact the validity and reliability of the data obtained.

4.1.2 MSO Observations

How well the members of the Investigation Departments understand the purpose and scope of the casualty database is reflected at multiple levels. The first level of impact is at the SIO management level. The resources that are directed to be expended on certain areas of concern or specific types of cases depend on the management's understanding and inference of what are the purpose and specific areas of concern and priority within the database. For example, some SIOs directed that personnel casualty cases be investigated by sending a form to the injured party, asking them basically to agree or disagree with the information submitted on the CG-2692; if the injured party agrees, the investigation is concluded. This can be interpreted as an inference by the SIO that personnel casualties are not high priority areas of concern, and thus needed information can be collected without large amounts of resources being expended to investigate personnel injury cases. This is a reasonable approach if sufficient information (relative to the purpose of the database) can be collected about personnel casualties. The problem is that a similar approach was not observed in all MSOs, leading to inconsistencies across MSOs.

The second level of impact is at the individual IO level. Each IO must understand the purpose of the database, and how fulfilling that purpose, other policies, specific areas of concern and expenditure of individual resources (i.e., time) are related to a specific case. The degree of understanding may then be translated into the amount of time spent on individual cases, and the way in which the time will be spent. If there is a lack of understanding of the purpose of the database, or uncertainty as to the importance of particular issues, then there will be uncertainty as to what resources should be devoted to particular aspects of investigation. Each individual IO will collect the information that he or she believes to be of greatest interest (or perhaps, the information requiring the least expenditure of resources.) There will be not standardization among IOs within an MSO or among different MSOs. An example is the personnel profile (e.g., age, weight, education) information requested in the optional MCHF supplement. Some IOs considered this as completely unimportant and never asked the mariners for this information. Other IOs tried to collect this information. If this information is unimportant, why is it requested at all? If it is important, some of the IOs do not understand the purpose of the requested information. There is significant inconsistency in data collected.

A third area related to understanding the purpose of the database and areas of specific concern and priority is that of needed technical expertise; what technical expertise is needed to fulfill the purpose and priorities of the database? If Coast Guard management establishes the need for complete and accurate data on a particular facet of marine casualties, then the technical expertise needed to collect the information must be resident at, or available to, the MSO. As the interview data show, the IOs do communicate with outside experts and at times make use of outside expertise during investigations. However, it is the IOs' job to investigate and to identify the technical expertise needed. If the IO does not have the level of technical expertise needed, the IO must obtain the needed technical expertise. If the IOs have an incomplete understanding of the purpose of the database and specific priorities and areas of concern, the IOs may not recognize the need for additional technical expertise and assume their own capabilities and efforts are sufficient.

The Investigation Departments have two goals which are not entirely compatible: one goal is to perform high-quality casualty investigations; the second is to train new investigators. To achieve the first goal, it would be desirable to have experienced investigators assigned to every case. But in order to achieve the second goal, it is necessary to assign relatively inexperienced investigators. Because of case loads and staffing constraints, it is not always possible to assign responsibility for cases to the most technically competent individual.

Technical expertise also becomes a question when there is no mechanism for checking the level of knowledge. Quality control is the responsibility of the SIO (or his designee). The SIO is, of course, influenced by his own interests and knowledge. For example, an SIO with an engineering background will have greater knowledge and interest in mechanical failures; an SIO with a legal background will have greater knowledge and interest in laws and litigation. The acceptability of this system will depend on the management identification and understanding of the areas of interest; and where resources are to be applied.

The particular focus for this report is the technical area of human factors. All IOs interviewed knew that there were places to report human factors information, but there was uncertainty as to its importance, and therefore, what resources should be expended in obtaining human factors information. In fact, when asked directly "what is human factors?," most responses suggested a superficial (at best) understanding of what human factors means (see Section 4.3.2 for further discussion).

4.1.3 Conclusions and Recommendations

The conclusion drawn from interviews and observation is that it was not always clear to the IOs what the areas of management concern are, and what the database purpose and scope are; therefore, it was unclear as to what resources were appropriate to spend on particular aspects of investigation. It was observed that individual MSOs would make decisions as to concerns and priorities, but these were not consistent nor standardized across MSOs. It is recommended that clear and specific guidance be given as to importance, level of resources, and level of technical expertise expected for various areas of concern. As will be discussed in section 4.6, these areas of concern may change over time, but clear guidance is needed by IOs. The IOs perform their jobs the best that they can, and with clear guidance will do all they can to supply the requested information. In the void of guidance, IOs will determine individual or group priorities and areas of concern, leading to inconsistencies in the casualty investigations and hence an unreliable database.

4.2 Collect valid and reliable data

4.2.1 Ideal

A second step, once areas of concern are identified and the purpose and scope of the database established, is to collect valid and reliable (i.e., truthful and consistent) data. Such data collection requires a standard approach for deciding which data are to be collected and how they are to be collected. The degree to which the quality of data collection is degraded will be mirrored by the degradation of the data.

4.2.2 MSO Observations

The IOs used a general investigation method consisting of case evaluation, followed by data collection combined with analysis. In general, the IOs used no formalized, standard methods for investigation. A few IOs mentioned the book by Kuhlman on accident investigation [25], and a few mentioned the International Loss Control Institute's Systematic Cause Analysis Technique. When asked how they investigated a case, almost all of the IOs responded with something like:

> I receive casualty information. I find out who the additional sources of information are. I contact them to find out what they know. Occasionally, it may then involve on-scene investigation. Then I sit down with the information, try to construct the chain of events, and establish the cause/contributing factors. I look for any one thing that's the main cause. I submit the case for final evaluation.

or

> I read the information. I call the guy being investigated last. I call the employer, the witnesses; get facts together, decide if there's merit to pursue it any farther. On casualty cases, I get physical evidence, maybe go to scene that day, interview the people while they're still fresh. Then I sit

down and come up with ideas. After I've exhausted all the leads and have the story, I decide what to do, for example, charge. Then I implement my decision.

Many IOs reported that data were collected piecemeal, which made continuity of cases and efficiency difficult. Many commented that data collection was equivalent to fact gathering. But there were also comments that it was sometimes difficult to know what information is important in any specific case, and what information was desired by USCG Headquarters and should be included in the case report. The feeling among IOs was that methodology was a matter of case type and personal preference. This lack of specific methodology also extends to the identification of root causes. As one ASIO said, "..no particular formula or method...largely based on prior experience...no uniform training or cadre of professional investigators." The fact that the IOs practice no specific methodologies is not really surprising, considering their general inexperience in investigation, and the fact that the Investigation Department course provides only a brief introduction to investigation (remember, also, that approximately one-quarter of the IOs interviewed had not received training via the Investigation Department course).

The IOs were asked what worked best in investigations. There were a range of answers. Of the 24 IOs who responded to this question:

- 8 suggested teamwork, or interactions with other IOs/SIOs
- 5 suggested elements of the Coast Guard-wide marine safety program (e.g., the Marine Safety Manual, subpoenas, regulations, IO authority)
- 4 suggested being good at talking with people
- 3 suggested having IO/SIO colleagues with legal background (i.e., lawyers)
- 2 suggested locally or individually developed checklists or aids, and
- 2 said "nothing else" or "didn't know."

Eleven of those who responded suggested that they rely on their colleagues (for teamwork or legal information) as what works best. Using local expertise is a powerful tool and supports the old adage that two (or more) heads are better than one. But reliance on individuals for information on the best way to carry out a process can be a two-edged sword, because of the question of what happens when that individual (or team) is no longer available. This is where consistency and availability of guidance relating to investigation, such as a methodology for collecting data, can serve a useful purpose. Of those respondents who mentioned methodological issues related to marine safety elements or materials, 2 of the 6 identified locally developed tools. This combination of responses suggests that there may be a place for standard guidance and tools, perhaps based on

a combination of expertise and already developed materials, to assist all IOs in collecting data, and performing investigations in general.

IOs were also asked what the major problems in investigation were. Most answers were related to data collection issues. Twenty-nine IOs mentioned problems, with some IOs giving more than one response:

- 10 mentioned difficulty in finding the people needed to talk with or obtaining truthful, reliable information from the people they did talk to
- 10 mentioned problems with the computer systems, including both lack of hardware availability and MINMOD-related problems
- 6 mentioned that there was not enough IO training or expertise available, including training and expertise on investigation issues and computer issues
- 3 said they had no major problems
- 2 said that there were too many cases and not enough time
- 2 said physically getting to a location (e.g., not having automobiles available to get to casualty or interview locations), and
- 1 mentioned that the timeliness of receiving completed CG-2692 was a major problem.

The IOs were asked three separate questions about obstacles to investigation (of which the above question on major problems was one). The other two questions were about organizational obstacles and general job obstacles. There was considerable overlap in answers to the three questions. Responses regarding problems (or obstacles) from the organizational and general job questions supported the above answers that locating witnesses and getting reliable information was a problem (2 additional responses); the computer system was an obstacle (with 9 additional responses); more training and expertise were needed (12 additional responses); and, caseload and available time was a problem (2 additional responses). The full text of the answers to these questions on investigation obstacles is found in Appendix E.

Problems related to the collection of valid and reliable data are discussed in the following paragraphs. The reported obstacles of 1) locating personnel and obtaining reliable information, and 2) time available and caseload, are addressed, as well as 3) problems related to collection of valid and reliable human factors data.

Difficulty in locating personnel and obtaining information. A major problem cited by IOs in collecting data is that of being able to obtain complete and accurate information about the casualty.

The two major parts of this problem are, first, the ability to locate the personnel they need to talk with and, second, once the person is found, the ability to obtain complete and accurate information.

Locating mariners can be quite difficult. By the nature of mariners' work, the mariners may be away from their permanent address for long periods of time, and their work is often of a temporary nature. Also, the mariners may live anywhere, not necessarily in the same region as the IO who is trying to locate them. This is related to the problem of timeliness of receipt of CG-2692. IOs report that CG-2692s are often filed some time after the casualty occurs, after the involved vessel(s) and/or personnel have already left port. This is another reason why IOs do not regularly visit the casualty scene; they may not know of the casualty for quite some time after it has happened.

Obtaining complete and truthful information from the mariners (or other involved personnel) is also reported as difficult. This may be a matter of interviewing technique. Interviewing is a skill that can be acquired with training and experience. Such skill includes the manner of interviewing, such as establishing rapport with the interviewee, as well as the content of the interview, such as knowing the right questions to ask and being knowledgeable about the subject of discussion. However, having difficulty in obtaining complete and accurate information may also be a matter of the interviewed person's not being forthcoming because of fear of potential penalties. This is an example of the tension that exists between the role of the investigator to find facts and determine causes as a means to enhance marine safety and prevent future casualties, and the role of the investigator as regulator and prosecutor, who has the responsibility to enforce the laws and regulations and promote marine safety by bringing to discipline individuals who have performed unsafe acts. This dual role of investigator and regulator has several potential impacts. First, people being interviewed as participants in, or witnesses to, the casualty may have a very difficult time distinguishing between the two roles, particularly if they are concerned that something they say may be used against them or a colleague. Therefore, information received from these individuals may not be complete or accurate. A second potential impact is that the IO may not separate these roles well, thereby always collecting information with a regulator's perspective. Observations and interviews suggest some of this latter potential impact may be occurring, particularly with regards to human factors related data. The IOs are looking for someone at fault, and if no one appears to be "at fault" then they may perceive no human factors of interest. The dual role of the IO as investigator and regulator is intrinsic to the job, but it does have potential impact on the validity of the casualty data collected and reported.

Time available/ Case workload. The question of IO workload and whether IOs had sufficient time to collect the appropriate data and complete cases was of interest. Data on how many cases were open were collected (see Section 3.4). IOs (especially the newer IOs) sometimes complained about having a large (average of 26) number of open cases to manage. However, when the IOs were asked whether the average time they spent on cases was enough time to do their job well, only 3 out of 20 responded "No" (not enough time to do job well). Other questions allowed IOs to mention any major problems they had in investigation and only 4 responses mentioned that too many cases and not enough time were major problems. These data suggest that lack of, or too little, time for investigation is not perceived as an enormous problem by the majority of IOs. However, it must also be pointed out that the current poor quality of data may be due in part to time available and case workload.

Collecting human factors data. The IOs were asked about how they collected human factors data. The basic answer was "No differently from other data," that human factors data are just a part of the other data. Several IOs did have specific strategies to collect human factors data. One of these was interviewing; they stressed various techniques such as asking "5W" questions, putting the interviewee at ease, interviewing peripherally-involved persons first, keeping interviewees separated before their interviews, relying on statutory authority, and letting the interviewee contradict himself. Another strategy mentioned to collect human factors data was collecting data to fit the MCHF; some IOs even carried a copy of the MCHF with them to on-scene investigations. Also mentioned was the importance of responding in close time proximity to the accident, to ensure that memories were fresh and that interviewees did not have time to concoct and agree on false statements. Brainstorming with other IOs to discover human factors data was also mentioned, as were organizing data by flowcharts, timelines, and layout drawings. Drug/alcohol testing was cited as an excellent way to discover human factors data, suggesting the perspective that human factors data are related to finding someone "at fault."

While all of the above strategies are certainly valid methods for collecting data in general, and human factors data in particular, there was little mentioned about gathering data to understand the causes underlying human error. A few IOs did talk about asking "Why," but generally, most regarded human factors as finding out which human(s) erred, rather than the causes leading to the error. It will also be noted that several of the above methods are somewhat adversarial in nature. This reflects the bias noted above toward "wearing a regulator hat" during investigation.

The problems IOs reported in collecting human factors data mirrored the problems in data collection in general, including timeliness of reporting, difficulty in contacting people, and the

feeling that interviewees were not forthcoming. They did, however, tie human factors data collection to several specific problems. These were: remaining objective and not rushing to judgment too soon; lack of knowledge, experience, training, and awareness where human factors are involved; and taking the time and setting the agenda to gather that kind of data.

4.2.3 Conclusions and Recommendations

IOs do their best to collect data, establish the facts and analyze them to understand causes. However, they do face obstacles in collecting data. IOs generally do not use any particular standard methodology to collect data. This may lead to incomplete and haphazard data collection. On the other hand, investigation time is often so short that IOs have to be selective in what data they collect. The lack of methodology is probably most serious when trying to establish the underlying causes of casualties; without a standard to follow, individuals tend to reflect their own biases, thus affecting data reliability. Adding to the difficulty of collecting data are the temporal and spatial difficulties in reaching involved vessel(s) and personnel. The dual role that investigators play (on one hand just trying to understand what happened, on the other hand acting as a regulator and enforcer) undoubtedly inhibits the responses of the persons with which IOs deal.

The IOs collect human factors data in pretty much the same way they collect any other data. There are two problems associated with this. The first is that data to reveal the underlying causes of human factors related casualties are often not collected. The second is that, for the most part, the IOs lack training in and awareness of human factors concerns. Without a human factors perspective, they are bound to miss most of the human factors data.

Job aids should be developed to assist IOs in data collection. Some MSOs or individual IOs have already developed aids for data collection, others have not. Of course, these job aids would have to be based on a specific understanding of exactly which kinds and details of data the USCG wants in its marine casualty database and the ultimate purpose to which the data will be put (see Section 4.1).

4.3 Determine human-related causes of accidents

4.3.1 Ideal

The third requirement is to determine appropriate causes of the casualty, specifically human factors-related causes. The human factors causes and contributing factors are related to all aspects of human performance and the effects of external factors (e.g., equipment design, management

policies, and environmental conditions) on human performance. IOs need to understand what human factors issues exist, that all casualties result from a chain of events, and that a high percentage of casualties have human factors related contributing factors.

4.3.2 MSO Observations

The *Marine Safety Manual* Vol. V, 3.E.3.g. Human Factors states, in part[3]:

> A high percentage of casualties are due to human error. However, quite frequently I.O.s fail to document the underlying reasons why the human error occurred. To provide a better understanding of these causes, a description of the human factors should be set forth in the facts.

Now, while this section of the MSM is addressing the old narrative report format, the statement applies quite well to the purpose of the human factors section of the MINMOD, and to investigation generally.

IOs' knowledge of human factors. An important prerequisite to data collection and determination of causes and contributing factors is to have technical expertise on particular topics. This is obvious in the case of mechanical issues. If one does not have knowledge of diesel generators, than it is difficult to know that an exhaust fire may have been caused by self-ignition of fuel deposited in the exhaust line at low powers. If an individual does not possess the required knowledge, then the alternatives are to obtain assistance from someone who has that expertise, or to work on obtaining the knowledge and developing the expertise for oneself. Comments from some IOs reflected the recognition that technical knowledge of ship engineering and equipment was important to being able to identify mechanical failures as casualty causes. A number of statements dealt with the importance of having some inspection experience before becoming an IO, specifically because of the technical knowledge one gains.

However, there was no similar recognition of the technical expertise required to identify human factors related causes of casualties. As a preliminary to asking the IOs about human factors data collection, the IOs were asked for their personal definition of human factors. The full text of their answers is in Appendix F. For the most part, the answers reflected an intuitive, albeit naive, understanding of human factors. Most of the answers involved the concept of human action (inaction) or human error as an immediate cause of a casualty. Several answers implied that human factors was only "stupidity" or "common sense." Only a few of the answers mentioned the concept of external factors as affecting human performance, and a subset of those mentioned the concept of human capabilities and limitations. Similarly, there was little indication in the answers of latent errors or the causes behind human error. Even for those few who recognized a lack of

knowledge related to human factors, there appeared to be few alternatives for seeking assistance and additional information. No consistent definition of human factors was given by IOs, nor were they aware if one existed.

A first lesson in the field of human factors is not to use oneself as the model for all humans' actions. It is wrong to assume that because "I" can lift a particular weight, everyone should be able to lift the same weight. Similarly it is wrong to assume that because "I" would understand a particular sign, that everyone would understand that same sign. Yet that is a common flaw in naive considerations of human factors. It appears, however, that this is a common approach by IOs who consider human factors issues (to the extent that they recognize them) in terms of what they would have done under similar circumstances rather than to look at the body of knowledge related to human capabilities and limitations.

If IOs do not have a complete understanding of human factors issues, then it is unlikely that the findings and conclusions regarding human factors-related causes of casualties will be fully developed. A naive understanding will most probably result in naive conclusions. This issue of technical knowledge and expertise in fields of interest suggests that IOs' ability to capture important human factors information and determine human factors causes is likely to be superficial and incomplete.

The IOs were asked how they determined human factors causes/contributing factors and how that differed from determining equipment or other causes/contributing factors. On this question the IOs were split between those who thought the process did not differ and those who thought that there was a difference. The IOs self-rated their ability to detect human factors causes as about average (i.e., an average of 4.8 on a seven point scale, with 7 being very good). However, some of the IOs who rated their ability to detect human factors causes as very good (6 or 7) also mentioned that this was their self-perception and did not have any baseline with which they could compare. So in the void of any baseline, they thought they were doing pretty well. Eighteen IOs said that it was more difficult to identify human factors causes. The reasons the IOs gave for this judgment focused mainly on the lack of physical evidence of human factors causes, the difficulty of getting evidence from witnesses who are trying to protect themselves, and the difficulty of coding human factors causes.

The Investigation Department course offered at RTC Yorktown does have some coverage of human factors, but it is only a brief introduction to the subject. The course does not provide the IOs with any human factors expertise. Human factors expertise was also generally not available

from the SIO/ASIOs, so quality control on judgments about human factors causes/contributing factors was lacking.

Causal chains and human factors causes. One of the outstanding features of the MINMOD is its structure that permits entry of a sequence of events and the associated causal chain leading to a casualty. Casualties rarely result from only one cause; instead, the casualty is usually the culmination of a sequence of events and multiple causes. This is clearly illustrated by an analysis of 100 accidents at sea, performed by Wagenaar and Groeneweg[5]: "The number of causes in the 100 accidents ranged from 7 to 58 with a median of 23." This shows that for these 100 accidents, the fewest number of causes identified was 7, with at more than half (i.e., >50) of the accidents having 23 or more identified causes. Based on this study, therefore, if a casualty is assigned only one cause, it is likely that not all relevant causal factors are being identified and reported.

IOs were asked to describe how they determined causes. A broad range of responses were obtained, which are presented in Appendix G. Of those who mentioned whether they attempt to find a single cause or multiple causes for casualties, eight said that they looked for a single, primary cause (although two of these also said they sometimes had multiple causes), while three said they looked for multiple causes (with one of the three saying he looked for two causes -- a physical cause and situation awareness). *Clearly, the IOs are not sufficiently aware of the need to uncover the causal chain behind an accident and to report it in MINMOD.* This may be due to the relatively small amount of time that IOs spend per case. This may also be due to the perceived difficulty of entering such data into MINMOD.

4.3.3 Conclusions and Recommendations

The IOs have little to no training on human factors. Their definitions of human factors, while on the right track, are too narrow and too simplified, as compared to those of experienced human factors investigators. The human factors training in the Investigations Department training course had helped a few of the IOs, but not the majority. Despite this general lack of training, the IOs do not fully understand the degree to which they are human factors novices; this is a common problem with almost everyone who has a cursory knowledge of a given field. Thus, while the IOs may feel confident in their abilities to identify human factors causes, in reality they lack the expertise to identify most types of human-related contributing factors.

The culture of the maritime world and the USCG, and the dual role of the IO as investigator and enforcer (and the fact that the enforcement role is perceived as more important), also contribute to the IOs' problem with determining human factors causes. Many IOs feel that human factors is

synonymous with human error, that stupidity is responsible for all human error, and that the person who makes an error is always responsible for that error. The need to code a chain of causation to more fully describe a casualty is not well understood by most IOs. This is especially true when human error is the proximate cause of an incident.

The determination of human factors related causes of accidents requires a specific understanding of which data the USCG wants in its marine casualty database. If the USCG wants accurate and reliable human factors data, it must train and equip its IOs to gather and analyze it. The current naive and non-causal state of the human factors data are directly traceable to a lack of training in human factors and to a lack of awareness of what kinds of data need to be entered into the database and how the data will be used. Just as IOs consult with fire investigation experts when they recognize the need for that specific expertise, there is no reason the IOs shouldn't also consult with human factors experts when human factors expertise is needed. Even if additional human factors expertise was readily available, general human factors training would still be necessary for all IOs in order to make them aware that most casualty investigations require human factors expertise.

The dual role IOs serve as investigator and enforcer (and the fact that most IOs see enforcement as more important) is an inherent barrier to good human factors investigation and thorough determination of causes. The USCG should recognize that this is a significant organizational hurdle in obtaining good human factors causal data.

4.4 Use a taxonomy which adequately represents the causes and contributing factors

4.4.1 Ideal

No matter how well casualty data are collected, and how accurately causes and contributing factors are determined, the information will not be useful (i.e., accessible for analysis) until it is put into the actual database. The tool which allows the translation of the raw data and cause information into material acceptable to the database is the database coding taxonomy. The taxonomy filters all the raw data from the "real" world (from all media, even including the investigator's thoughts and feelings) and outputs a limited set of codes which still adequately reflects the original data, and are subject to statistical analysis. Without accurate coding, the information in the database will not be an accurate description of the casualty investigation results, thereby invalidating future analyses of the data and making the database useless. An ideal taxonomy should do two things well: it should (1) allow the coder to easily and accurately describe what happened and why, and (2) should allow

the database analysts to easily extract and analyze needed information. There are trade-offs between these two goals however; as coders are allowed greater descriptive latitude, the analysts must contend with an ever larger and unwieldy database (after all, no one casualty is ever exactly like another). Similarly, if data categories are severely limited for ease of analysis, the coders are faced with coding situations for which no codes exist. These trade-offs mean that the development of an ideal taxonomy is an iterative process, with coders finding both missing and excess codes, and analysts discovering both missing and excess analysis capabilities. Of course, the coder who is also an analyst (or vice versa) is in the best position to evaluate these iterative refinements.

The ideal taxonomy for the USCG to determine causes of human error is non-redundant, clearly defined, and allows different levels of available detail to be captured (i.e., cases with large amounts of detail can be coded, as can cases with skimpy detail). The taxonomy must also be usable by the IOs, which implies that it should be tailored to specific USCG concerns, short, and free of psychological terms unfamiliar to the average IO (i.e., the taxonomy should use terminology consistent with the level of human factors knowledge expected of the IOs). In addition, the taxonomy must exhibit validity and reliability for it to be of practical and statistical use. Finally, the taxonomy should be comprehensive so that future USCG actions are not based on incomplete data.

Successful implementation of the taxonomy and use of the resulting data also require an independent check on how well the taxonomy is being used, an on-going evaluation to improve and upgrade the taxonomy, and that USCG human error expertise be available to the IOs.

Problems may still occur in the use of even an ideal taxonomy. For example:

- the reliability of any taxonomy may be stretched by the relative inexperience of the majority of the IOs with human error concepts (training might alleviate this problem);
- the tendency of IOs (and everyone else) to carry specific mental models with them into an investigation and to end up always reporting a few "favorite" causes;
- collecting data necessary to code human error causes may require resources (e.g., time, manpower) that will take away from resources available for investigation of other causes (or even if it doesn't, the IO may feel that it does);
- collecting data necessary for coding human error causes can be quite complex, depending on the level of detail desired in the database (this is related to the scope and purpose of the database, see Section 4.1).

The development of a taxonomy for determining causes of human error must take these problems into account. If so, despite the potential problems, a well-conceived taxonomy can provide useful information.

4.4.2 MSO Observations

One of the most positive aspects of the MINMOD implementation is that it moves the responsibility for coding to the person with the most direct case knowledge, the IO. Ideally, this allows the most knowledgeable person to make causal and coding choices that best fit the circumstances. Of course, this assumes a well conceived and non-redundant taxonomy. While letting the IO determine causes and coding has potential for increased validity and reliability, the current implementation is flawed.

Although there are multiple database coding taxonomies used in MINMOD, the following discussion will deal primarily with the human factors taxonomies (i.e., those used in the MCDD and MCHF). However, two problems in the IOs' use of MINMOD appear to extend to all the taxonomies: the codes are insufficiently defined and the codes are incomplete.

Lack of definition of codes leads to lack of reliability in the database; what one IO means when using an undefined code is not necessarily what another IO means when using the same code. Definitions are critical in establishing a common "language" among coders. Without definitions, each coder is, in essence, using a separate taxonomy. There is no official transaction guide for MINMOD. The unofficial guide developed by G-MMI does not contain any definitions for the MCHF taxonomy, and based on the confusion exhibited by the IOs, the definitions for the MCDD taxonomy are apparently inadequate.

There are missing codes in MINMOD (e.g., running through a tow rope is not there, bodies of water such as the South China Sea and the Colorado River are missing, problems with lifesaving equipment not associated with abandonment cannot be coded, etc.). Missing codes are of concern to the IOs primarily because they feel forced to choose another code and thus enter inaccurate information. Incompleteness makes the task of coding reports frustrating for the IOs. An approach reported by IOs is to code the information as well as possible, realizing the coding may be misleading, and then explain the situation (and miscoding) in the narrative supplement. This approach, reasonable from the coder's perspective, has a detrimental effect on statistical validity.

Human Factors Taxonomies

The codes in the human factors taxonomies are not understood by the IOs. The IOs do not know what the code abbreviations stand for (i.e., does cont. stand for contingency or for control) or what the codes are intended to mean.

A large part of the reason for the IOs' lack of understanding of the human factors taxonomies codes is the lack of adequate definitions for the codes (as discussed above). However, it is the authors' opinion that an equal problem are the taxonomies themselves. The taxonomies confuse (1) errors (e.g., "navigation execution") with (2) causes of errors (e.g., "operates under false hypothesis") with (3) what system was involved with the errors (e.g., "radar signals"). That is, some taxonomy entries identify a specific human error, some identify causes of error, and some identify systems that the error was associated with; all useful data, but they belong in separate taxonomies.

The six main human factors classes for the MCDD ("situational awareness," "situational assessment," "navigation strategy," "navigation execution," "control strategy," and "control execution") are not mutually exclusive ("situational awareness" and "situational assessment" overlap, for instance, and "navigation" is mixed with "control") and make use of terms which are not well defined (e.g., "situational awareness"), even among human factors professionals. The use of these six classes by the IOs reflects the lack of definitions and the overlap; the IOs' use of these classes can almost be termed haphazard, and *any analyses made from these data will be invalid.* The IOs simply do not relate to, and are unaware of, the structure implied by the taxonomy (that human actions progress through the six classes). This is partly due to the fact that the classes are displayed in alphabetical, and thus reverse, order. Most IOs tend to use only those classes which have been explained to them or for which they have been able to determine their own meaning, based on the obvious meaning of the words in the class names. Most IOs are not aware of even the limited definitions of the classes found in the unofficial *MC Guide* [26]; the definitions for the MCDD classes are found at the end of the MCHF section. It should be noted that some SIOs try to correct IO code bias in their reviews, but even the SIOs were not completely conversant with the meanings of the classes, and given the lack of sufficient definitions, have developed their own code biases.

The human factors subclasses for the MCDD which come under the six main classes share the same problems as the main classes, and have the additional problem of not being at the same level; some subclasses are specific to a single main class (e.g., "navigation into known adverse conditions") while others are appropriate to all the six main classes and are at a much higher level

(e.g., "progress monitor"). When the IOs see subclasses that are not appropriate to the main class they have just coded, they report both confusion and annoyance. The state list, the same as found in the MCHF, and discussed further below, was also found to be confusing. No comments were made regarding the "role" list. The taxonomy should have a hierarchic structure so that only appropriate choices are available when proceeding down from the top level.

The human factors class codes for the MCHF are different from either of the above sets of codes and use seven classes ("communication;" "knowledge/proficiency;" "management;" "mental influence;" "physical influence;" "rules, regs, policy;" "stat signals/indicators"). Again, these seven classes lack definitions, and contain overlap (e.g., "communication" really contains "stat signals/indicators," and "management" is confused with "rules, regs, policy"). As with the MCDD classes and subclasses, the IOs' use of these MCHF classes is inconsistent, with bias depending on personal preference or training or SIO review. IOs often skip completion of the MCHF to avoid dealing with these seven MCHF classes, along with their associated Sub Classes and States.

The Sub Classes and States form the next two taxonomy levels underneath the seven human factors classes for the MCHF (the States are also used on the MCDD). The Sub Classes and States share the same problems as the MCDD classes and subclasses and the MCHF classes, but are much worse in their use of jargon (e.g., "expectancy," "currency," "sufficiency," "phraseology" are used in the Sub Classes) and in presenting inappropriate choices (e.g., the State list does not change depending on choices already made). The States also have overlap problems (disregarded vs. ignored, improper vs. incorrect, misinterpreted vs. misunderstood). IOs also questioned the need to make single choices from these codes, rather than being able to enter multiple Sub Classes per Class and multiple States per Sub Class.

To further understand the IOs' use of the human factors taxonomies, the IOs were asked to define the six main human factors enabling factors classes on the MCDD, and the seven human factors classes on the MCHF. The wide range of definitions can be seen in Appendix H. These responses also show that some individuals could not give any definition for some of the classes. On the MCDD classes, the abbreviation "Cont," as in "Cont Execution" and "Cont Strategy," was known by only a few of the IOs. Specifically, for "Cont Execution," nine of the IOs responded that they did not know what it meant, three thought it had to do with the contingency plan, five responded that it was related to continuous, continuity, or continuing execution, and seven did not know what "Cont" meant but gave appropriate examples of execution. The "Cont" classes were widely confused with the "Navigation" classes, and the "Sit" classes were confused with each other. On the MCHF classes, the abbreviation "Stat" was known by only a few; "Mental

Influence" was confusing for many; and there was a general complaint that there were no good definitions available.

After being asked to define the codes, the IOs were asked to rate (on a scale of 1-7, with 7 being very good) their understanding of the human factors codes and their confidence in the accuracy of the human factors that they record in the MINMOD. The results are in Table 6 in Appendix B. Generally the IOs rated themselves average on their knowledge of the codes and the accuracy of their coding. Comments associated with these ratings again reflected lack of definitions and overlapping codes.

How IOs choose MINMOD codes, and what they do if they can't find a code, are closely related, and reveal problems with the MINMOD taxonomies. The IOs reported that the process of choosing a code is a subjective one (e.g., "educated guesswork," "look for one that seems to fit," "use best guess") and if an exact code can't be found, then the solution is to "just pick one," "interpolate," "...decide it wasn't really human factors, after all," "force-fit," "best guess or leave it blank." The similarity of the responses to these questions makes it seem like the IOs can never find the codes they want. That obviously isn't true, but the lack of definition of codes may lead the IOs to feel that the entire coding practice is a subjective one.

4.4.3 Conclusions and Recommendations

The human factors taxonomies used for coding the MCDD and MCHF are confusing and difficult. They contribute to the IOs' misunderstanding of human factors. The concepts embodied in, and the logic behind, the taxonomies are almost wholly absent from the IOs' understanding. The lack of an overall coherent single picture (the use of separate taxonomies for the MCDD and MCHF) adds to the confusion. The use of terms that are jargon or that have no agreed upon definitions hurts the reliability of the taxonomies. The IOs are not using the taxonomies in a standard, unbiased way. The taxonomies are incomplete and limit the abilities of the IOs to code what actually happened. The taxonomies should be logically based on the information the USCG wants to derive from the database. This logic is not apparent in the present taxonomies.

The MCDD and MCHF taxonomies must be extensively revised. The taxonomy use (i.e., to code errors or to code causes of errors) and degree of detail need to be carefully determined. The taxonomies needs to consider the training and experience levels of the IOs (see Section 4.3). For example, if short-term IO billets will remain the norm, then the taxonomies must use less technical jargon; this then means less precise inferences can be made from the data in the database. The taxonomies should logically agree with the stated purpose for a marine investigation database and

must reflect the policy decisions regarding the goals of the Investigation program (see Section 4.1). In developing revised taxonomies, an approach that is sure to yield substantial benefits is to "user test" the taxonomies during development; send proposed revisions to IOs for short term use and ask for comment on definition, structure, and usefulness. The IOs interviewed for this study (assumed to be representative of all IOs) are strongly committed to doing a good job and will provide valuable feedback as the taxonomies are revised.

4.5 Correctly and efficiently enter data into database

4.5.1 Ideal

The fifth requirement is to correctly and efficiently enter the developed data, including casualty causes, into an automated database. To state the obvious, an automated database is vital for its ability to store and manipulate large amounts of data. The computer database should be able to be used in an efficient and effective way by those who will enter the data. If data are difficult to enter, due to the design of the computer hardware and software, the accuracy and repeatability of the data entry are degraded. There is a wealth of information on human-computer interface design[21-23] that, when applied, will result in systems that maximize user satisfaction and minimize opportunities for data input errors.

4.5.2 MSO Observations

The IOs access MINMOD via the USCG standard workstation. They also use the USCG standard software such as Document Designer. The computer is generally used at the beginning of a case to open the case and then is not used again until the investigation is finished and the collected information is ready to be input. An exception to this is that the computer is occasionally used to retrieve personnel and vessel information. IOs reported getting on the computer 3 to 4 times from the start to the end of an average case. This includes initial case opening, data entry, revisions, and closing.

Most IOs use the computer daily. The IOs, on average, report spending about one-third of their time on MINMOD data entry. That they spent at least this much time was confirmed by answers to a second question that asked IOs to estimate the actual hours they spend on different aspects of a case. The IOs, on average, spent between 2 and 2.5 hours on the computer out of 5.5 to 7.5 hours total average case time.

The IOs listed problems with the MINMOD computer system as an obstacle in performing their jobs. It is interesting to note, though, that in general the IOs do not fear or dislike computers. Some mentioned how useful Document Designer and the Marine Inspection products of MSIS were. IOs see the generic advantage of using computers as tools in their work. Both hardware and software concerns were mentioned as obstacles. As the examination of the IOs' use of the computer was an important part of this study, the answers to the extensive questions on computer use are included in Appendix I. The subsections below summarize the major problem findings, how the IOs deal with those problems, and what effect MINMOD has on the IOs' jobs.

Problems With MINMOD As can be seen in Appendix I, the IOs listed a large number of problems with the MINMOD system*. Most of these issues can be categorized as hardware problems, lack of adequate documentation, poor MINMOD human-computer interface, lack of an adequate "help" function, and lack of training. Each of these issues is addressed below.

- Hardware problems - The hardware concerns focused on the lack of computer workstations and the difficulty of finding a "free" computer to work on. Several IOs mentioned that they changed their schedules (e.g., came in early or on the weekend) to gain access to a computer terminal. A second hardware-related concern was the connection to the USCG mainframe system and the attendant network issues. Problems with availability (i.e., downtime) and response rates (e.g., extreme slowness during peak use hours) were mentioned by a number of IOs. The third hardware concern is that a modern graphical user interface (GUI), which would be clearly superior to the present system, is not feasible with the present system; the hardware will not support an advanced GUI. Most of the IOs who had been exposed to GUIs expressed dismay at the backwardness of the MINMOD interface.

- Lack of adequate documentation of the system - This is probably the single largest problem with MINMOD. Several of the following problems would be greatly minimized by the presence of adequate documentation. The IOs particularly suffer from the lack of code definitions and the lack of documentation of the relationships between the various product sets. Documentation available for the MINMOD at the MSOs was basically the product set guides for MC, MV, and PA cases, dated in April 1993 (this was at the time of the data collection visits in Sept-Nov, 1993, when the latest draft version of the *MC Guide* was dated August 1993). Some had more up-to-date versions of the guides, some had

* This discussion relates to MINMOD problems present at the time of the interviews (Sept. - Nov., 1993). Since that time a few of these problems have been corrected and others are under review.

only one or two of the guides, some had release notices from Headquarters, and some had local compilations of MINMOD information. All but 3 of the 27 IOs interviewed on this point used the available documentation. Fourteen of the 27 deemed the documentation inadequate for their needs. Examples of the reasons why the documentation was judged inadequate include:

- manual is not user friendly, tedious to use (7 responses);
- manual is too voluminous, too much of a pain to sort through (2 responses);
- manual isn't laid out like the case is laid out (1 response);
- manual is out-of-date (i.e., hasn't kept up with changes to the system) (2 responses);
- documentation has missing sections; is incomplete (1 response);
- manual has skimpy definitions for some terms/codes and lacks some definitions altogether, needs good definitions and examples for all terms/codes (6 responses);
- documentation doesn't explain well enough what exactly is wanted in every block (i.e., what is to be coded) (1 response);
- documentation needs samples/examples of raw data and how they are coded (3 responses);
- manual needs to differentiate between optional and required fields (2 responses);
- the guide to the codes is coded itself (3 responses).

The 13 IOs who judged the documentation adequate nevertheless repeated most of the above comments. None of the IOs thought the documentation was good (one IO said parts of the *MC Guide* [26] were pretty good).

- Difficulty in making changes to information already in MINMOD - Almost all of the IOs revised information that had previously been input into MINMOD. IOs were evenly split into those who made many changes (8), those who made some changes (11), and those who made few changes (7). Major reasons for changes included: documentation of extra case information; changes required by reviewers; or simply changing entry mistakes. The problems associated with making changes all revolved around the various cross-connected locked fields in MINMOD. For example, when a case is marked to be sent to review, the MCNS (Narrative Supplement) becomes a "read-only" supplement, preventing further editing. The SIO must call Headquarters to have the field "unlocked" in order to make corrections to the MCNS. The perception is that these locked fields are arbitrary and serve no useful purpose. The IOs were sometimes forced to delete previously completed work (e.g., supplements) in order to make changes, resulting in wasted time and increased

frustration. While these deletions may not have been necessary in all cases, the IOs did not have sufficient knowledge of the system to take any other than a brute force approach of deletion and re-entry. The lack of documentation mentioned above exacerbates this problem.

- Poor Human-Computer Interface - Many IOs remarked that the MINMOD system was unfriendly. Often, perceptions of computer friendliness revolve around human-computer interface (HCI) issues. As part of the investigation into how the IOs use the MINMOD computer program, a standard human factors evaluation was made of the human-computer interface of the MINMOD program. This was not an exhaustive evaluation, but intended rather to note obvious HCI problems with the system. The evaluation was aimed primarily at the form and structure of the interface, rather than at the content of the MINMOD program (which is discussed in Section 4.4 and elsewhere in this section). Several references were used in the evaluation [13-15]. The evaluation revealed a number of HCI deficiencies in the MINMOD program. The deficiencies are set out in Table 1, Appendix J, which lists specific guidelines for good HCI, examples from MINMOD where those guidelines are broken, and whether or not the deficiency was specifically mentioned by one or more of the IOs. The guidelines used in the HCI evaluation represent principles for interface design that are known to aid human performance and to assist in reducing human error and frustration. As Table 1, Appendix J, shows, the MINMOD program violates a number of these basic HCI guidelines and many of these violations were sources of IO complaint. It should be noted that some of these deficiencies (such as response time problems) are inherent in the USCG standard workstation and network, with which the IOs must work.

  One major principle of HCI violated by MINMOD is that of *consistency*. Consistent screen formats, consistent acronyms and abbreviations, consistent field size and location, consistent required and optional fields, consistent HCI navigation actions, and consistent naming (of product sets) are all important in HCI. MINMOD exhibits lack of consistency in each of these areas. Without documentation, the user must rely on patterns in the system to learn how to use it (and even good documentation cannot deal with the latent errors caused by inconsistency). The lack of consistency makes learning the system particularly difficult. An example of inconsistency is inconsistency in abbreviations. In some locations, two letter abbreviations are used, while other places have three letter abbreviations, and still others have four letter abbreviations. The term "equipment failure" is abbreviated on the MCDD as EQ, while on the IAPR, it is abbreviated EQP.

Another HCI principle is *clarity*, that specific terms should have specific meanings. This is not always true in MINMOD. For instance, the word "class" is used for at least four different purposes within MINMOD. On the IAPR, "class" is used to mean the classification of marine casualties (e.g., "major," "serious," etc.). On the MCDD, "class" refers to (1) a second-level descriptor for type of event (e.g., "crossing," "meeting," etc.) and (2) to a top-level human factors causal/enabling factor ("cont execution," "sit awareness," etc.). On the MCHF, "class" refers to (2) from the MCDD as well as to a separate top-level human factors classification (e.g., "communication," "mental influence," etc.).

MINMOD also violates some basic *screen readability* principles. The lack of consistent functional groupings (combining information of like types into identifiable and recognizable groups), the failure to distinguish between field labels and field text, the use of all capital letters for text (rather than mixed case), and the high screen packing density (around 70%, rather than the recommended 25%-50%) all combine to make the MINMOD screens harder to read, hence prone to error.

The MINMOD system violates an HCI principle when it is *not tolerant of human limitations*. MINMOD does not reduce requirements on human memory, rather it makes quite extensive demands on memory with memorization of codes. In particular, IOs must remember which fields are required and which are optional. Conditions such as no built-in dictionaries of codes, poor automatic search capabilities, and lack of a spelling checker all force humans to perform tasks for which they are not suited. The system is also intolerant of mistakes in both entry and command lines, forcing the user to completely redo, rather than just edit.

The *response times* of MINMOD are also an important HCI matter. The problem may lie with the hardware as mentioned above, but the interface does not help the IOs deal with the slow response time by providing time cues to the user. The slowness of the system is a major aggravation to the IOs, and the uncertainty of the response time adds to it.

The important HCI principle of providing help to the user is also a problem in MINMOD. This raised so many comments from the IOs that it is discussed separately below.

- Lack of an adequate "Help" function - The current MINMOD "Help" functions are limited to "Help" screens which are primarily lists of codes. The MINMOD "Help" screens are lacking in definitions and examples. The screens are not context specific (in that they

don't take into account the information already entered) and thus often do not answer the IOs questions. However, most of the IOs use the "Help" screens each time they work with MINMOD. Nineteen of 27 IOs judged the "Help" screens as not useful, or inadequate; complaints included:

- doesn't really explain or define which data should be entered, no descriptions or examples of raw data and how they should be coded (8 responses);
- takes too long to come up, too slow (4 responses);
- don't know what the abbreviations on the help screens are, still a code to a code, too abstract (7 responses);
- the only help screen is "explain," would be useful to have more information (3 responses);
- often the help screen does not specify the required format for the entry (1 response);
- not context specific, not situation specific (4 responses);
- doesn't give information on system-subsystem mismatches (2 responses);
- takes away the screen you're working on (2 responses);
- when you exit help, it takes away the help message; can forget the code before you get back to where you needed help (1 response).

Aside from the above "Help" screens, which the user must call up (replacing the screen in question), MINMOD does not provide "Help." Missing desirable functions include: diagnostic error messages, error clarification dialogues which lead the user to the correct command or data entry, on-line dictionaries, and on-line reference manuals.

- Lack of training on the system - Without documentation, extreme consistency and rigid logic, the learner must rely heavily on training. The IOs have little or no formal training on using MINMOD. There is a small amount on formal MINMOD training in the IO course, and some SIOs/ASIOs have put together local formal MINMOD training (e.g., MINMOD was part of regular local training sessions at MSO New Orleans). Some also mentioned short course training conducted by USCG HQ personnel. The IOs learn the system primarily by on-the-job training, and the SIOs/ASIOs and experienced IOs spend a good deal of time training the new IOs in the use of the system. Locally produced training materials (e.g., MINMOD lessons learned, MINMOD training courses, samples of coded cases) were present in each MSO visited. Therefore, while there may be consistency within an Investigation Department, there is not necessarily consistency across

Investigation Departments. The training in the IO course does not prepare the IOs to use MINMOD (and really cannot in such a short time, given the above deficiencies, and the importance and breadth of the other topics which must be covered). Fifteen out of 29 IOs reported they were adequately trained to use MINMOD, 13 reported they were not, and 1 did not answer directly yes or no. Those who did not feel adequately trained often cited problems with coding (e.g., lack of definitions, different interpretations) which have been noted above.

Getting Around Problems With MINMOD The IOs were asked how they got around problems with MINMOD and who they went to for help with MINMOD. SIOs, ASIOs, and other IOs were viewed as primary sources for problem solving and help. Other ways to get around problems include: "abort," "use NEC code," "use any code that will work," "do bare minimum." Other sources of help include problem reports, personnel at HQ, and the MSIS hotline. Therefore, the approaches used solved the immediately perceived problem of completing, for example, a product set, but often result in less information entered into the database (e.g., "do the bare minimum") or entry of incorrect information (e.g., "use any code that will work"). *The IOs get MINMOD to work at the expense of valid and reliable data.*

The Effect Of MINMOD On The IO's Job The IOs were asked about the overall effect of MINMOD on their job, both good and bad. When asked how the use of MINMOD made their jobs harder, the IO's answers reflected the problems noted above.

When asked how the use of MINMOD made their jobs easier, 4 of the 22 responded that it did not make their job easier in any way. The 18 IOs who gave examples of how it made their jobs easier gave answers that included:

- prompts to do thorough investigation, organizes case and data, structured format; forces complete investigation, tells you what you forgot (8 responses);
- personnel, vessel, and historical information more easily available (8 responses);
- eliminates long narrative (in some MSOs) and letter of transmittal (2 responses);
- easier to spin-off cases (1 response);
- easier than writing out apparent causes and chain of events (1 response);
- prints out charge sheets (some thought inadequate), FOIA requests (1 response);
- sometimes maps over information from one form to another (1 response);
- a powerful desktop tool with great potential to support the work (1 response);
- reduces paperwork (1 response).

The overall impression given by the IOs was that MINMOD was a good conceptual idea (the idea of a marine casualty investigation database, and of professionals making input decisions, using the computer as a tool), but that the implementation of the idea was deeply flawed and was more of a hindrance than a help in performing their jobs.

4.5.3 Conclusions and Recommendations

The human-computer interface of the MINMOD system is poor and should be re-designed with user testing. Some of these problems are due to the nature of the current USCG standard workstation and network. If possible, any new system should incorporate Graphical User Interface technology. Any new interface should also consider HCI from the beginning of design. Considering the novice status of most users, any new system should be sure to incorporate extensive "Help" features.

The lack of decent documentation is, far and away, the biggest immediate problem with MINMOD. Much of the data entered into the system thus far must be regarded as suspect due to this lack. The most important step the USCG can take to improve data quality is to quickly issue good, user-centered, user-tested, documentation. Without real documentation of the system (preferably paper rather than on-line, given the slowness of the system), other measures are only short term fixes.

The IOs see small benefits in the MINMOD system and many large disadvantages. They cannot access most of the information on the system, even that which they have put in, and therefore it is seen as a burden. The IOs feel absolutely no ownership in the system. They do not know why the data are being gathered, what is being done with the data, and what the evidence is that the whole enterprise is worth while. It should be made clear to the IOs what data need to be in the marine casualty database, why the data need to be there, and what is being done with the data (see Sections 4.1 and 4.6). IO access to use the database would greatly increase their interest in the quality of data going into the system.

The "locking" feature of the interface is a major problem for the IOs. The inability to change data and to close screens is responsible for loss of data and for incorrect data. No fields should be locked until time of final submission.

The number of computer terminals is a problem in some MSOs. The time required on the system necessitates a computer on each IO's desk. The network MINMOD runs on is unacceptably slow from a user standpoint; up to 7 minutes to change screens is unacceptable; recommendations from

1989 (ancient in computer terms) recommend a maximum of 1 second to go to the next screen! The possibility of downloading batched information from personal computers (PCs) could be a solution to this problem.

4.6 Use the database as a means for feedback

4.6.1 Ideal

The sixth, and last, requirement is to use the database as a means for feedback to improve the system. There is the obvious use of the database system to answer questions for which it was designed. The queries and associated analyses may address any number of topics. The primary users (i.e., analysts) of the database are at USCG HQ and were not considered within the scope of this project. The interest here is the use of the database by IOs, the degree to which it is used (or not used) effectively, and how the use (or non-use) will enhance (or degrade) the IOs' performance in collecting and entering data.

The database can be used as a feedback mechanism in several different ways. Analysis of data can identify new or reinforce old areas of concern, which can then be conveyed to Investigation Departments as guidance in determining how best to utilize resources (as described in Section 4.1). Feedback from the database can also be used to provide information about skills that need to be developed by individuals or organizations, thereby providing information for managing training. Two important aspects can result: 1) SIOs (and others within the MSO) can use the database feedback as management tools, to identify places where emphasis is needed that are unique to their MSOs, for prevention management, and as feedback for professional development of IOs; and, 2) IOs can gain feedback regarding the impact that the data input has on the output generated. Individuals have a much greater stake in the quality of the data input if they are also users of the data output.

4.6.2 MSO Observations

As currently designed, those who are responsible for the input of data to the casualty database are not the users of the database. Reports can be requested from USCG Headquarters, but were reported to take considerable time to be received. In general, SIOs, particularly, would like to be able to query the database for feedback related to cases at their MSOs. They would like to use the database as a means to identify potential problems and be proactive in prevention or mitigation of marine safety problems. Examples given included using the database to keep track of casualties

reported for specific companies, vessels, or masters. Such information could be used to actively seek out marine safety problems as opposed to responding only to reported incidents.

During the interviews, several of the IOs questioned the use of the data collected and indicated that they had no feedback on the use of the data, nor any idea about the interest of those at USCG Headquarters in the data that were collected. When asked about major problems in investigation, one IO said, "We don't see the results, what purpose does it serve?" Another IO said that there is a problem with what USCG Headquarters wants from the field from the computer system and questioned the point of the data being generated.

4.6.3 Conclusions and Recommendations

The impact of not having feedback from the database system available at the unit level is twofold. First, the SIOs, in particular, perceive a lack of access to information that could serve as a tool in proactively promoting marine safety and in managing their Investigation Departments. Secondly, the IOs do not see or understand the use of their work. This situation impacts the work done by not providing any feedback as to importance of the data as well as not promoting self-interest in the data; if they don't use the data, the completeness or quality of the data does not affect them. Allowing the MSOs free access to the information in the MINMOD database would help the IOs to understand the uses and the importance of the data they enter.

5. SUMMARY AND RECOMMENDATIONS

The 1994 Business Plan for the USCG Office of Marine Safety, Security, and Environmental Protection (G-M) [Ref. 27, Enclosure 1, page 4] states that the casualty investigations carried out by the MSOs "provide our principal feedback to the [G-M] program in assessing risk and gauging our effectiveness." The analyses of accident data are also intended "to assist field units in targeting their efforts" [Ref. 27, page 3]. The MINMOD was envisioned as the vehicle for collecting and analyzing marine casualty data. The area of human factors was cited as a new area of emphasis in the G-M Business Plan, based on its role in causing marine accidents. However, in order to make meaningful inferences from the data in the MINMOD, those data must be accurate, reliable, and complete. Analysis of the interview data revealed a number of substantive problems with the collection and recording of human factors data. It was concluded that *much of the human factors data in the MINMOD is inaccurate, unreliable, and incomplete. Therefore, these data cannot be used either to understand the magnitude of human factors safety problems or to focus efforts to combat these problems.* Any analyses of the human factors data in the MINMOD will be equivocal at best, and certainly should not be used as the basis for regulatory decision-making.

In order to make meaningful inferences from the MINMOD database, the data within it must be accurate, complete, and reliable. Section 4 of this report set out six steps which influence the accuracy, completeness, and reliability of the MINMOD database. In order to achieve useful human factors causal data, the Coast Guard must make fundamental changes in its approach to casualty investigations, starting with Step 1 (establishing the purpose and scope of the MINMOD). Below are the conclusions drawn for each of the six steps and recommendations for how the Coast Guard can improve its casualty investigation and reporting process, particularly with reference to the collection of human factors causes of marine accidents.

5.1 Establishing the purpose and scope of the database (particularly with regards to human factors data)

5.1.1 Problem Summary

Most field personnel in Investigation Departments do not fully know the purpose of the MINMOD. They are unclear as to what resources are appropriate to spend on particular aspects of investigation. They view much of the MINMOD data as excessive and of little or no value. There are many complaints that USCG HQ policy is not clear as to what types of data are valued by HQ

under different situations (i.e., which MINMOD fields are considered "required" and which are "optional" for a given case). Individual MSOs make decisions as to concerns and priorities, but these are not consistent nor standardized across MSOs. The lack of a clear understanding of the rationale for collecting the MINMOD data sometimes leads to the collection of the minimum amount possible, which is dictated by which fields are required and which are optional in the MINMOD software. Since the MCHF is "optional," it is often not filled out (and is thought by some to be less valued by Headquarters). Contributing to the confusion over policy and rationale is the fact that field personnel never see the results of their efforts: they receive no feedback from USCG HQ about the statistical analyses of the data, and they do not have access to the database to run analyses that could be useful to their work (see Section 5.6).

5.1.2 Recommendations

Recommendation: It is strongly recommended that a top-down review of the casualty analysis goals be conducted, and that the data requested from the field be revised and limited to those items required to meet the goals. This step affects all subsequent steps and is therefore very important. Clear policy statements need to be generated regarding the types of causal information the USCG desires and in what situations certain types of information become important. However, such policy is predicated upon the formulation of a plan which identifies precise goals for the Investigation program, and which clearly relates the data to be collected in the field to those goals. If such a plan does exist, the IOs are not aware of it, and do not understand the rationale for all of the data which MINMOD requests.

Recommendation: It is further recommended that clear and specific guidance be given as to importance, level of resources, and level of technical expertise expected for various investigation areas of concern. In addition, very specific guidance should be given as to whether the USCG is only interested in casualty causes it can easily affect through regulatory action, or whether it is interested in all casualty causes. IOs should be made aware of the purpose and use of the MINMOD database, and of each kind of information that goes into it.

5.2 Collect valid and reliable data

5.2.1 Problem Summary

There are many obstacles to the collection of complete and accurate causal data. They include organizational obstacles and investigation obstacles. The primary organizational obstacles have to do with the manner in which the IO departments are staffed. The relatively short (one year

average) time that is spent as an IO dictates that the investigations will essentially be performed by novices. This is compounded when IOs have not had prior Inspections experience. Add to this the average three-month wait before attending the Investigation Department Course (which can only introduce the basics in three weeks), and IOs really do not have much of a chance to become proficient in investigation. The current caseload makes in-depth investigation of each case unrealistic. By choosing to staff the IO departments in this manner, the USCG accepts a certain level of superficiality in investigation. In addition, the dual role of the IO as investigator and prosecutor is a problem. Investigation obstacles include lack of methodological tools and difficulty in contacting persons and vessels and thus missing the opportunity to collect complete and accurate data.

It is doubtful that the human factors data in the MINMOD (MCDD and MCHF) are meaningful. Some IOs even tend to view human factors as equivalent to "operator error" or "stupidity/inattention." This limited view, combined with a lack of understanding as to why human factors data should be collected, leads to an incomplete investigation of human-related causes of marine casualties. Most IOs do not document the causal chain of events; they select what they consider to be the most important cause and document only that one. Therefore, the chain of events and causal information in the MCDD is often incomplete.

5.2.2 Recommendations

Recommendation: Keep expectations consistent with reality. The USCG must consider the organizational obstacles which IOs face, and balance the need for data against those obstacles. The USCG may have unreasonable expectations of its Investigating Officers; given the organizational obstacles, they simply may be unable to gather the amount and quality of information necessary to fill the MINMOD database with quality information with which to perform desired analyses.

Recommendation: Consider organizational changes to increase experience level. Possible changes include: increasing the length of the IO tour, encouraging specialization in Investigation, and making use of civilian investigators.

Recommendation: Standardize investigation methods

Job aids should be developed to assist IOs in standardizing their data collection. Almost all professional incident investigators use such job aids. To collect good human factors causal information, the IOs must be more aware of the limits of their human factors knowledge, and investigate with greater human factors sensibilities. The IOs could also benefit from more training in investigative techniques, such as advanced interviewing techniques.

5.3 Determine human-related causes of accidents

5.3.1 Problem Summary

The IOs have little to no training on human factors, and the IOs do not fully understand their lack of human factors knowledge. Thus, what the IOs perceive as human factors causes are often overly simplistic. In addition, they lack the knowledge to successfully apply a graded approach to the investigation of human factors.

The other major problem in determining human factors causes is the dual role of the IO as investigator and enforcer (and the fact that the enforcement role is perceived as more important). The need for determining causation is not well understood when human error is the cause of a casualty.

5.3.2 Recommendations

Recommendation: The USCG should make sure that the IOs recognize their lack of expertise in human factors, and either correct that lack by training or make outside human factors expertise available to the IOs.

Recommendation: The USCG should consider separation of investigation for cause from investigation for possible violations. The dual role of investigator and enforcer is a significant organizational hurdle in obtaining good human factors causal data. Although we understand that investigation for cause is currently separate in concept from investigation for possible violations, in practice the investigations are often not separated. IOs often gather information once that is used both in analysis of cause and in S&R proceedings. Sometimes, causal investigations are quickly concluded (perhaps too quickly) as soon as it is determined that no personnel actions are appropriate.

5.4. Use a taxonomy which adequately represents the causes and contributing factors

5.4.1 Problem Summary

The human factors taxonomies used for coding the MCDD and MCHF are confusing and difficult. It contributes to the IOs' misunderstanding of human factors. The IOs are not using the taxonomy in a standard, unbiased way, because they do not know the meanings of the terms of the

taxonomies. The taxonomy is both incomplete and redundant and limits the abilities of the IOs to code what actually happened.

5.4.2 Recommendations

Recommendation: The MCDD and MCHF taxonomies must be extensively revised. The taxonomies should consider IO training and experience and reflect USCG policy on the goals of the Investigation program. Definitions should be integral to the taxonomies. User testing should be an integral part of the development of the new taxonomies.

5.5 Correctly and efficiently enter data into database

5.5.1 Problem Summary

The human-computer interface (HCI) of the MINMOD system is poor; many basic HCI principles are broken by the system. There is no good documentation of the system. IOs cannot use the data and do not understand why all of the requested data are necessary and thus have little stake in the data quality. In some MSOs there is a shortage of computer terminals. The response time of the system is unacceptably slow. In sum, the MINMOD system is so actively user-hostile that it degrades the quality of the data being entered. Some of these problems are due to the nature of the current USCG standard workstation.

5.5.2 Recommendations

Recommendation: The human-computer interface of the MINMOD system should be redesigned with user testing. In addition, MINMOD should request only those data which are consistent and necessary to the purpose and scope of casualty investigation. The new version of MSIS for the CG Standard Workstation III is under development. It is crucial for the developers to receive the results of this study and to employ human factors experts in the design, development and evaluation of the new MSIS so that mistakes are not repeated. The new system should incorporate Graphical User Interface technology and incorporate extensive "Help" features.

Recommendation: Documentation for MINMOD should be issued as soon as possible. The most important step the USCG can take to quickly improve data quality is to quickly issue good, user-centered, user-tested, documentation. Without real documentation, other short term fixes will not dramatically improve data quality.

5.6 Use the database as a means for feedback

5.6.1 Problem Summary

The SIOs are particularly disturbed by the lack of access to MINMOD information that could serve as a tool in proactively promoting marine safety and in managing their Investigation Departments. The IOs do not see or understand the use of their MINMOD work. This does not promote interest in the data and the quality and completeness of the data are adversely affected. The MINMOD system has lost the expert evaluation skills of scores of IOs by not submitting the system to extensive user testing.

5.6.2 Recommendations

Recommendation: The USCG should allow MSOs as free a use of the MINMOD data as possible. Headquarters data analyses should be provided to the field. Feedback on the MINMOD database should be very actively encouraged from the field. New products, and changes to current products, should be extensively user-tested before issue.

Recommendation: USCG Headquarters should evaluate completeness and accuracy of MINMOD entries and provide periodic feedback to the field. Providing feedback evaluations to the field would aid the IOs in collecting even better data.

5.7 Summary

The Investigating Officers are interested in performing their jobs the best that they can and IO concerns about the MINMOD system prompted this research. During this study, the IOs described difficulties in investigation, and in use of the MINMOD, which indicate that some current data in the MINMOD database are invalid and unreliable. Six steps to achieve a valid and reliable database have been described. The MINMOD system has been described in terms of these six steps. Many recommendations for system improvements have been described. As system improvements are implemented, the quality of casualty data, and particularly human factors data, will be improved.

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Appendix A

Structured Interview and Data Collection Forms

Name_____MSO_____

Structured Interview for IOs

Interview Location(MSO)_____Interviewer_____Date(s)_____

Time(s)_____(Start & Finish)

Section 1. Demographics

*1. Name: _____

2. Sex: F M

3. Age: _____

4. Highest grade completed?_____ Degree(s)_____Major(s)_____

*5. Rank: _____ (for civilians:title,GS, for reservists:rank and time/exp, related work)

*6. Time in CG: ____yrs____mos

*7. Time in this MSO: (current tour)____yrs____mos

*8. Previous Coast Guard Experience:

(previous tour)____yrs____mos When_____Where_____What_____

(previous tour)____yrs____mos When_____Where_____What_____

(previous tour)____yrs____mos When_____Where_____What_____

(previous tour)____yrs____mos When_____Where_____What_____

*9. Any similar or related investigation experience outside the Coast Guard? Yes No

If Yes, describe_____

_____

*10. Attended IO course at Yorktown RTC? Yes No

If Yes, record month/year_____record time as IO before attendance_____

Other IO training _____

_____

_____

Name_____MSO_____

11. Any similar or related training? Yes No

If Yes, describe_____

_____

_____

12. What other formal Coast Guard training have you attended? _____

_____

_____

_____

13. Any psychology/human factors training? Yes No

If Yes, describe_____

_____

14. Any computer training? Yes No

If Yes, describe_____

_____

15. Any other computer use (home, etc.)? Yes No

If Yes, describe_____

_____

Section 2. Organizational Structure

*1. What are your five primary job activities and what percentage of your time do you spend on each?

Activity_____ Percent_____

Activity_____ Percent_____

Activity_____ Percent_____

Activity_____ Percent_____

Activity_____ Percent_____

Name_____MSO_____

2. Who do you interact with, how often, and under what circumstances?

within the MSO?_____

_____

_____

_____

outside the MSO?_____

_____

_____

*3. How many open cases do you have right now?_____

*4. During the past 6 months, what was the most open cases you had?____the least?____

5. Approximately, how many new cases are you assigned each week?____

6. Is there such a thing as an average case? Yes No

If Yes, describe_____

_____

_____

If No, are there classes of cases? Yes No

If Yes, describe_____

_____

_____

*7. What is the average, maximum, and minimum amount of time you spend per case (or per case per class) on:

*total case Avg_____Max_____Min_____

gathering information, interviewing, etc. Avg_____Max_____Min_____

analysis Avg_____Max_____Min_____

paperwork Avg_____Max_____Min_____

computer entry Avg_____Max_____Min_____

other (list)_____

Name_____MSO_____

*8. Are the above average times enough to do your job well? Yes No

If No, describe the ideal amount and division of time

*total case_____

gathering information, interviewing, etc. _____

analysis _____

paperwork _____

computer entry _____

other (list)_____

*9. Describe a typical day:_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

10. What are your normal working hours?_____daily_____hrs a week_____add. duty hrs

*11. What performance criteria are you rated on in your job? (specific to IO - other than just standard OER categories)_____

_____

_____

_____

12. Are there any things in the organizational structure of this MSO or the Coast Guard that keep you from being the best IO that you could be? Yes No

If Yes, describe_____

_____

_____

_____

Suggestions for improvement_____

_____

_____

Section 3. Investigation Process

A. General

1. How are cases initiated?_____

_____

_____

2. How are cases assigned(current load, area of expertise, experience, rotation, other)?

_____

_____

*3. How do you investigate a case? What steps do you take? Walk through a case with me (in general)_____

_____

_____

_____

_____

_____

_____

Name_____MSO_____

*4. What documents or other items do you use during an investigation? (books, forms, unit-specific aids, checklists, etc.- get dates and sources of MINMOD guidance)_____

_____

_____

5. What are your major problems in your job?_____

_____

_____

_____

Suggestions for improvement_____

_____

_____

*6. What are your major problems in investigation specifically?_____

_____

_____

_____

Suggestions for improvement_____

_____

_____

7. What are the things that work the best in your job?_____

_____

_____

_____

_____

*8. What are the things that work the best in investigation specifically?_____

_____

_____

_____

Name_____MSO_____

9. Where did you learn what you know about investigating?_____

10. Where/who do you consult if you have a question or problem?_____

*11. Do you ever interact with IOs (or others) from other MSOs/MIOs? Yes No

If Yes, how does your work differ from that at other MSOs?_____

*12. If you attended the IO course at Yorktown RTC, how does your work differ from what you were taught there?_____

13. Have you ever worked in an MSD/MID (marine safety/inspection detachment) doing IO work?

Yes No

If Yes, how did that work differ from your current work?_____

Name_____MSO_____

14. When does a pollution case become an IO case? Do you interact with the pollution investigators? Yes No

If Yes, describe how?_____

_____

_____

_____

*15. How do you determine root and contributing causes (i.e., causal/enabling factors) of casualties? What methods do you use? How do you decide to look beyond an initial, obvious cause? Do you usually identify multiple causes? How many "causes" are enough?____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

B. Human Factors Data

*1. What is your definition of human factors?_____

_____

_____

_____

_____

Name_____MSO_____

*2. How do you collect human factors data during an investigation? What types of questions do you ask to determine if human factors is involved? Do you have any specific questions you ask witnesses or any other techniques to collect human factors data? (or do you know anyone else who has special techniques?)_____

3. How do you come up with human factors causes or contributing factors? How does that process differ from determining equipment factors or other factors?_____

*4. Rate your ability to detect human factors causes (on scale of 1-7, with 7 being very well)._____

Is it more difficult to identify human factors causes? Yes No

Why or why not?_____

Name_____MSO_____

*5. What are your greatest problems in obtaining/analyzing human factors related data?

_____

_____

_____

Suggestions for improvement_____

_____

_____

*6. What are the things that work the best in obtaining/analyzing human factors related data?

_____

_____

_____

7. Do you ever collect human factors information that is later eliminated through review process?

Yes No

If Yes, why is it eliminated?_____

_____

_____

8. Do you investigate human factors related issues the same or differently for pollution cases?

_____

_____

_____

Section 4. Computer Systems

1. What computer resources do you have/use?

hardware _____

software _____

people (system manager, other?)_____

_____

Name_____MSO_____

*2. When do you use the computer during an investigation of a casualty? (any use, but specifically MSIS and MINMOD) During a case, how many times do you work on the computer?

_____

_____

_____

_____

_____

3. How are the computers scheduled?

come in after hours each person has one first come, first served

other _____

4. How does being on a network affect your work? not at all use during off-peak hours

a lot of down time [how much? _____] other_____

_____

5. Do you use PCs at all? Yes No

If Yes, for what_____

*6. What training do you have (specifically) on the MINMOD? _____

_____

_____

Do you feel you are adequately trained? Yes No

Why or why not?_____

_____

_____

*7. What is your experience working with MINMOD? _____yrs_____months

_____

_____

Name_____MSO_____

*8. How often do you use the MINMOD?_____

*9. What documentation (or other aids or information) do you have? (if not addressed in Q4,Sec3,p6) _____

Do you use the documentation? Yes No

Why or why not?_____

Is it adequate for your needs? Yes No

Why or why not? Suggestions?_____

10. How does the use of the MINMOD make your job easier? What do you like about it? How does it help you in your job? _____

11. How does the use of the MINMOD make your job harder? What do you dislike about it? How does it hinder you in your job? _____

Name_____MSO_____

*12. List the problems you have with MINMOD (both interface and organization)

_____

_____

_____

_____

_____

_____

Suggestions for improvement. What would you like to see in MINMOD?_____

_____

_____

_____

13. Do you use the help screens (i.e., ?F6) Yes No

If Yes, what is your frequency of use of the help screens?

seldom sometimes often every time I enter data

Is the information on the help screen useful/adequate? Yes No

If No, explain. Suggestions for improvement?_____

_____

_____

_____

14. How often do you make changes to information already input in the MINMOD?

never sometimes often

What problems do you have in making changes to information already input ?

_____

_____

Suggestions for improvement_____

_____

_____

Name_____MSO_____

*15. Do you ever use human factors as a causal factor on the MCDD? Yes No

If No, explain why_____

_____

_____

If Yes, do you encounter any problems?(e.g., choosing the codes; entering data)

Suggestions for improvement?_____

_____

_____

_____

Give example for each enabling factor:

Cont Execution_____

Cont Strategy_____

Nav Execution_____

Nav Strategy_____

Sit Assessment_____

Sit Awareness_____

*16. How often do you use the human factors supplement?

never sometimes every time I have an HF causal factor

Why? In what situations do you use the human factors supplement?_____

_____

*17. Is the human factors supplement easy/hard to use? Easy Hard

What problems do you have in using the human factors supplement? Suggestions for improvement?_____

_____

_____

_____

_____

Name_____MSO_____

*18. Give example for each HF Class:

Communication_____

Knowledge/Proficiency_____

Management_____

Mental Influence_____

Physical Influence_____

Rules, Regs, Policy_____

Stat Signals/Indicators_____

*19. Rate your understanding of the human factors codes? (on a scale of 1-7, with 7 being very well)____

Comments?_____

*20. How do you decide which code to use?_____

_____

_____

*21. What do you do if you can't find a code you want? Do you have any examples of situations that can't be coded?_____

_____

_____

_____

*22. What is your confidence in the accuracy of the human factors codes that you record?

(on scale of 1-7, with 7 being very confident)

in the MCDD?_____

in the MCHF?_____

Suggestions for improvement_____

_____

_____

Name_____MSO_____

*23. How do you get around the problems you encounter with the MINMOD? _____

_____

_____

_____

_____

_____

24. Where (or who) do you go to for help with MINMOD? Specifically, the human factors part?

_____

_____

_____

_____

Section 5. Suggestions/Job Aids

1. What is the one things/who is the one person that really help you in your job? _____

_____

_____

_____

_____

*2. Do you have any suggestions for other things that would really help you (or others) as an IO?

_____

_____

_____

_____

***Section 6. Any other comments?**

Structured Interview for SIOs/ASIOs

Interview Location(MSO)_____Interviewer_____Date(s)_____

Time(s)_____(Start & Finish)

Section 1. Demographics

*1. Name: _____

2. Sex: F M

3. Age: _____

4. Highest grade completed?_____ Degree(s)_____Major(s)_____

*5. Rank: _____

*6. Time in CG: ____yrs____mos

*7. Time in this MSO: (current tour)____yrs____mos

*8. Previous Coast Guard Experience:

(previous tour)____yrs____mos When_____Where_____What_____

(previous tour)____yrs____mos When_____Where_____What_____

(previous tour)____yrs____mos When_____Where_____What_____

(previous tour)____yrs____mos When_____Where_____What_____

*9. Any similar or related investigation experience outside the Coast Guard? Yes No

If Yes, describe_____

_____

*10. Attended IO course at Yorktown RTC? Yes No

If Yes, record month/year_____record time as IO before attendance_____

Other IO training _____

_____

_____

Name_____MSO_____

11. Any similar or related training? Yes No

If Yes, describe_____

_____

_____

12. What other formal Coast Guard training have you attended? _____

_____

_____

_____

13. Any psychology/human factors training? Yes No

If Yes, describe_____

_____

14. Any computer training? Yes No

If Yes, describe_____

_____

15. Any other computer use (home, etc.)? Yes No

If Yes, describe_____

_____

_____

Section 2. Organizational Structure

*1. Describe the MSO organization

Name_____MSO_____

*2. How many IO billets are there?_____ How many IOs?_____

*3. What are your (SIO) five primary job activities and what percentage of your time do you spend on each?

Activity_____ Percent_____

Activity_____ Percent_____

Activity_____ Percent_____

Activity_____ Percent_____

Activity_____ Percent_____

*4. What are the IOs' five primary job activities and what percentage of time do they spend on each?

Activity_____ Percent_____

Activity_____ Percent_____

Activity_____ Percent_____

Activity_____ Percent_____

Activity_____ Percent_____

5. Who do you interact with, how often, and under what circumstances?

within the MSO?_____

_____

_____

_____

outside the MSO?_____

_____

_____

_____

Name_____MSO_____

*6. What is the work flow for IO cases? How are casualty cases assigned (current load, area of expertise, experience, rotation, other), worked, entered in computer, approved?_____

*7. What performance criteria are IOs rated on? (specific to IO - other than just standard OER categories)_____

*8. What performance criteria are you (SIO) rated on for your job?_____

9. Are there any things in the organizational structure of this MSO or the Coast Guard that keep your IOs from being the best they could be? Yes No

If Yes, describe_____

Suggestions for improvement_____

Name_____MSO_____

10. What training activities for IOs (concerning investigation) are available/ongoing/planned/ needed?_____

_____

_____

11. Do you think some kind of advanced IO training would be useful? For whom? What content?_____

_____

_____

Section 3. Investigation Process

A. General

*1. How are casualty cases investigated? What steps are taken? Walk through a case with me (in general)_____

_____

_____

_____

_____

_____

_____

_____

*2. What do you do to ensure that cases are adequately investigated? How do you determine what "adequate" is? Does investigation adequacy differ from case to case?_____

_____

_____

_____

_____

_____

Name_____MSO_____

3. What are your major problems in your job?_____

_____

_____

Suggestions for improvement_____

_____

In the IO job, specifically_____

_____

_____

Suggestions for improvement_____

_____

*4. What are the major problems, from your perspective, in investigation specifically?

_____

_____

Suggestions for improvement_____

_____

For the IO, specifically_____

_____

_____

Suggestions for improvement_____

_____

5. What are the things that work the best in your job?_____

_____

_____

For the IO, specifically_____

_____

_____

Name_____MSO_____

6. What are the things that work the best in investigation specifically?_____

_____

_____

For the IO, specifically_____

_____

_____

*7. How do you make use of your expertise in investigation (cases, teaching, review)?

_____

_____

_____

*8. Do you ever make use of outside (the MSO) investigation expertise? Yes No

Why or why not?_____

_____

_____

9. How often do you advise IOs on individual investigations?_____

_____

*10. Do you ever interact with SIOs (or others) from other MSOs/MIOs? Yes No

If Yes, how does work here differ from that at other MSOs?_____

_____

_____

_____

*11. If you attended the IO course at Yorktown RTC, how does work at this MSO differ from what you were taught there?_____

_____

_____

_____

Name_____MSO_____

12. Have you ever worked in an MSD/MID (marine safety/inspection detachment) doing IO work?

Yes No

If Yes, how did that work differ from your current work?_____

_____

_____

_____

*13. When does a pollution case become an IO case? Do you interact with the pollution investigators? Yes No

If Yes, describe how._____

_____

_____

_____

*14. How do your IOs determine root and contributing causes (i.e., causal/enabling factors) of casualties? What methods are used? How do they decide to look beyond an initial, obvious cause? Do you usually identify multiple causes? How many "causes" are enough?

_____

_____

_____

_____

_____

_____

_____

*15. Are recommendations (for preventing recurrences) generated? Never Sometimes Often

What is the generation and review process?_____

_____

_____

_____

Name_____MSO_____

*16. Are there recommendations which are not made because the Coast Guard can't implement them (e.g., design flaws, management policies)? Yes No

If Yes, any specific examples?_____

_____

_____

_____

*17. What "formal" reviews or approvals are performed on the IOs casualty investigation work? For what? In what detail are the reviews or approvals made?_____

_____

_____

_____

_____

_____

*18. Does this MSO ever work with the NTSB? Yes No

If Yes, who has what responsibilities? Who determines root causes? Are separate reports generated?_____

_____

_____

_____

_____

B. Human Factors Data

*1. What is your definition of human factors?_____

_____

_____

_____

_____

Name_____MSO_____

*2. How are human factors data collected during an investigation? Do you have any specific questions you ask witnesses or any other techniques to collect human factors data? (or do you know anyone else who has special techniques?)_____

3. How do your IOs come up with human factors causes or contributing factors? How does that process differ from determining equipment factors or other factors?_____

*4. What are your IOs' greatest problems in obtaining/analyzing human factors related data?

Suggestions for improvement_____

Name_____MSO_____

*5. What are the things that work the best in obtaining/analyzing human factors related data?

_____

_____

_____

_____

*6. What is the review process for human factors information?_____

_____

_____

_____

Is the human factors information ever eliminated during the review process? Yes No

If Yes, why is it eliminated?_____

_____

7. Are human factors related issues investigated the same or differently for pollution cases?

_____

_____

_____

_____

Section 4. Computer Systems

1. What computer resources do your IOs have/use?

hardware _____

software _____

people (system manager, other?)_____

_____

_____

Name_____MSO_____

2. When is the computer used during an investigation of a casualty? (any use, but specifically MSIS and MINMOD) During a case, how many times is the computer used?

_____

_____

_____

_____

_____

*3. How do you determine that investigation data are completely entered into the MSIS system? What is your unit's policy on completing the "optional" fields in the MINMOD? What is your unit's policy with respect to amount of detail and/or time spent on human factors causes?

_____

_____

_____

_____

_____

*4. What quality controls are applied to data entered into the MSIS system?

_____

_____

_____

*5. How are the computers scheduled?

come in after hours each person has one first come, first served

other _____

*6. How does being on a network affect your work? not at all use during off-peak hours

a lot of down time [how much? _____] other_____

_____

7. Do you use PCs at all? Yes No

If Yes, for what_____

Name_____MSO_____

*8. What training do you have (specifically) on the MINMOD? _____

_____

Do you feel you are adequately trained? Yes No

Why or why not?_____

_____

*9. What is your experience working with MINMOD? _____yrs _____months

_____

_____

_____

*10. How often do you use the MINMOD? _____

*11. What documentation (or other aids or information) is available here? (get date and source of documentation)_____

_____

_____

Do the IOs use the documentation? Yes No

Why or why not?_____

_____

Is it adequate for the IOs and your needs? Yes No

Why or why not? Suggestions?_____

_____

*12. How does the use of the MINMOD make your (and IOs') job easier? What do you like about it? How does it help you in your (and IOs') job? _____

_____

_____

_____

Name_____MSO_____

*13. How does the use of the MINMOD make your (and IOs') job harder? What do you dislike about it? How does it hinder you in your (and IOs') job?_____

*14. Do you currently use any MINMOD output? What would you like to see in terms of MINMOD output for your/MSO use?_____

*15. List the problems you (and IOs) have with MINMOD (both interface and organization)

Suggestions for improvement What would you like to see in MINMOD?_____

Name_____MSO_____

16. Do you use the help screens (i.e., ?F6) Yes No

If Yes, what is your frequency of use of the help screens?

seldom sometimes often every time I enter data

Is the information on the help screen useful/adequate? Yes No

If No, explain. Suggestions for improvement?_____

_____

_____

17. How often do you make changes to information already input in the MINMOD?

never sometimes often

What problems do you have in making changes to information already input ?

_____

_____

_____

Suggestions for improvement_____

_____

_____

*18. Are human factors ever used as a causal factor on the MCDD? Yes No

If No, explain why._____

_____

_____

If Yes, are there any problems? (e.g., choosing the codes; entering data)

Suggestions for improvement?_____

_____

_____

_____

Name_____MSO_____

*19. Give example for each enabling factor:

Cont Execution_____

Cont Strategy_____

Nav Execution_____

Nav Strategy_____

Sit Assessment_____

Sit Awareness_____

_____

*20. How often is the human factors supplement used?

never sometimes every time there is an HF causal factor

Why? In what situations is the human factors supplement used?_____

_____

*21. Is the human factors supplement easy/hard to use? Easy Hard

What problems are there in using the human factors supplement? Suggestions for improvement?_____

_____

_____

_____

*22. Give example for each HF Class:

Communication_____

Knowledge/Proficiency_____

Management_____

Mental Influence_____

Physical Influence_____

Rules, Regs, Policy_____

Stat Signals/Indicators_____

Name_____MSO_____

*23. Rate your understanding of the human factors codes (on scale of 1-7, with 7 being very well).____Comments?_____

*24. How do you decide which code to use?_____

_____

_____

_____

*25. What do you do if you can't find a code you want? Do you have any examples of situations that can't be coded?_____

_____

_____

*26. What is your confidence in the accuracy of the human factors codes that are recorded?

(on scale of 1-7, with 7 being very confident)

in the MCDD?_____

in the MCHF?_____

*27. How do you get around the problems encountered with the MINMOD? _____

_____

_____

_____

_____

_____

28. Where (or who) do you go to for help with MINMOD? Specifically, the human factors part?

_____

_____

_____

***Section 5. Any other comments?**

Structured Interview for Pollution Investigators

Interview Location(MSO)_____Interviewer_____Date(s)_____

Time(s)_____(Start & Finish)

Section 1. Demographics

*1. Name: _____

2. Sex: F M

3. Age: _____

4. Highest grade completed?_____ Degree(s)_____Major(s)_____

*5. Rank: _____ (for civilians:title,GS, for reservists:rank and time/exp, related work)

*6. Time in CG: ____yrs____mos

*7. Time in this MSO: (current tour)____yrs____mos

*8. Previous Coast Guard Experience:

(previous tour)____yrs____mos When_____Where_____What_____

(previous tour)____yrs____mos When_____Where_____What_____

(previous tour)____yrs____mos When_____Where_____What_____

(previous tour)____yrs____mos When_____Where_____What_____

*9. Any similar or related investigation experience outside the Coast Guard? Yes No

If Yes, describe_____

_____

_____

10. What formal Coast Guard training have you attended?_____

_____

11. Any psychology/human factors training? Yes No

If Yes, describe_____

_____

Name_____MSO_____

12. Any computer training? Yes No

If Yes, describe_____

_____

13. Any other computer use (home, etc.)? Yes No

If Yes, describe_____

_____

Section 2. Organizational Structure

*1. What are your five primary job activities and what percentage of your time do you spend on each?

Activity_____ Percent_____

Activity_____ Percent_____

Activity_____ Percent_____

Activity_____ Percent_____

Activity_____ Percent_____

*2. What is the average time you spend on a case?_____What percentage of this time is spent on the computer?_____

Section 3. Investigation Process

A. General

*1. Do you interact with the investigating officers (IOs)? Yes No

If Yes, when are IOs called? Who handles the case? How is the case coordinated? What input do you expect from the IO?_____

_____

_____

_____

_____

Name_____MSO_____

B. Human Factors Data

*1. What is your definition of human factors?_____

_____

_____

_____

_____

*2. How do you collect human factors data during an investigation? What types of questions do you ask to determine if human factors is involved? Do you have any specific questions you ask witnesses or any other techniques to collect human factors data? (or do you know anyone else who has special techniques?)_____

_____

_____

_____

_____

_____

3. How do you come up with human factors causes or contributing factors? How does that process differ from determining equipment factors or other factors?_____

_____

_____

_____

_____

_____

*4. Rate your ability to detect human factors causes (on scale of 1-7, with 7 being very well).____

Is it more difficult to identify human factors causes? Yes No

Why or why not?_____

_____

Name_____MSO_____

*5. What are your greatest problems in obtaining/analyzing human factors related data?

_____

_____

_____

Suggestions for improvement_____

_____

_____

6. What are the things that work the best in obtaining/analyzing human factors related data?

_____

_____

_____

Section 4. Computer Systems

*1. When do you use the computer during an investigation of a pollution incident? (any use, but specifically MSIS and MINMOD) During a case, how many times do you work on the computer?

_____

_____

_____

_____

_____

*2. What training do you have (specifically) on the MINMOD? _____

_____

_____

Do you feel you are adequately trained? Yes No

Why or why not?_____

_____

Name_____MSO_____

*3. What is your experience working with MINMOD? _____yrs _____months

_____

_____

*4. How often do you use the MINMOD?_____

*5. What documentation (or other aids or information) do you have? (get dates and sources of documentation)_____

_____

_____

Do you use the documentation? Yes No

Why or why not?_____

_____

Is it adequate for your needs? Yes No

Why or why not? Suggestions?_____

_____

_____

6. How does the use of the MINMOD make your job easier? What do you like about it? How does it help you in your job? _____

_____

_____

_____

7. How does the use of the MINMOD make your job harder? What do you dislike about it? How does it hinder you in your job?_____

_____

_____

_____

_____

_____

Name_____MSO_____

*8. List the problems you have with MINMOD (both interface and organization)

_____

_____

_____

_____

_____

Suggestions for improvement. What would you like to see in MINMOD?_____

_____

_____

_____

_____

9. Do you use the help screens (i.e., ?F6) Yes No

If Yes, what is your frequency of use of the help screens?

seldom sometimes often every time I enter data

Is the information on the help screen useful/adequate? Yes No

If No, explain. Suggestions for improvement?_____

_____

_____

10. How often do you make changes to information already input in the MINMOD?

never sometimes often

What problems do you have in making changes to information already input ?

_____

_____

_____

Suggestions for improvement_____

_____

_____

Name_____MSO_____

*11. Do you ever use human factors as a causal factor on the MCDD? Yes No

If No, explain why_____

_____

_____

If Yes, do you encounter any problems?(e.g., choosing the codes; entering data)

Suggestions for improvement?_____

_____

_____

_____

Give example for each enabling factor:

Cont Execution_____

Cont Strategy_____

Nav Execution_____

Nav Strategy_____

Sit Assessment_____

Sit Awareness_____

*12. How often do you use the human factors supplement?

never sometimes every time I have an HF causal factor

Why? In what situations do you use the human factors supplement?_____

_____

_____

*13. Is the human factors supplement easy/hard to use? Easy Hard

What problems do you have in using the human factors supplement? Suggestions for improvement?_____

_____

_____

_____

Name_____MSO_____

*14. Give example for each HF Class:

Communication_____

Knowledge/Proficiency_____

Management_____

Mental Influence_____

Physical Influence_____

Rules, Regs, Policy_____

Stat Signals/Indicators_____

*15. Rate your understanding of the human factors codes? (on a scale of 1-7, with 7 being very well)____

Comments?_____

*16. How do you decide which code to use?_____

_____

_____

*17. What do you do if you can't find a code you want? Do you have any examples of situations that can't be coded?_____

_____

_____

_____

_____

*18. What is your confidence in the accuracy of the human factors codes that you record?

(on scale of 1-7, with 7 being very confident)

in the MCDD?_____

in the MCHF?_____

Name_____MSO_____

*19. What problems do you have with the human factors codes (either the HF causal factor or the supplement)? (e.g., meaning, consistency, comprehensiveness)_____

_____

_____

_____

Suggestions for improvement_____

_____

_____

*20. How do you get around the problems you encounter with the MINMOD? _____

_____

_____

_____

_____

_____

21. Where (or who) do you go to for help with MINMOD? Specifically, the human factors part?

_____

_____

_____

***Section 5. Any other comments?**

Task Information Sheet

Observer_____
Date_____MSO_____
IO_____

Time Start	Time Stop	Task	Interfaces	Job Aids

Time Start and Stop in 24 hr local clock time
Task -- describe what the individual is doing to the desired level of detail (overlapping tasks are OK)
Interface -- with what is the individual interacting (e.g., person, equipment, paper, telephone)
Job Aids -- what is the individual using to assist in accomplishing task (e.g., checklist, prepared list of questions, example)

Computer Use Sheet

Observer_____
Date_____MSO_____
IO_____

Time Start	Time Stop	Product Set	Terminal/ printer?	Problems / Notes	HF Causes HF Codes	#F6	#F7	Other Help

Terminal/Printer? -- which terminal/printer (as identified on layout drawing) is being used for this activity?
Problems/Notes -- list any problems or other noteworthy items
HF Causes/HF Codes -- list the # and type of HF causal factors in MCDD; # and type of HF codes in MCHF
#F6 -- tally of #times F6 used for help to codes,etc.
#F7 -- tally of #times F& used to identify and fix data errors
Other Help -- tally of #times any other help is sought (from people, code book, etc.)

Appendix B

Detailed Data Tables

Table 1. Positions of Interviewed Personnel

Office	Positions of Interviewed Personnel
MSO Puget Sound	the SIO, 5 IOs
MSO New Orleans	the SIO, the ASIO, 5 IOs, 2 Pollution Investigators
MSO Morgan City	the SIO, the ASIO, 4 IOs
MSO/Group Los Angeles/Long Beach	the SIO, 4 IOs, 1 Pollution Investigator
MSO Baltimore	the SIO, 3 IOs
MIO New York	the SIO, the ASIO, 3 IOs, 1 Data Entry Person

Table 2. Demographic Data on Interviewed Personnel

Position	Age (yrs)	Time in Coast Guard (yrs)	Time in Current Job (mos)	Previous Investigation Experience	Previous Investigation Experience (mos)	Rank
SIO/ASIO	$\bar{x}$=38.8 n=8 range 33-45 σ=3.7	$\bar{x}$=16.5 n=9 range 9.7-21.8 σ=3.5	$\bar{x}$=15.7 n=9 range 3-30 σ=9.7	Yes=5 No=4	$\bar{x}$=35.8 n=5 range 12-50 σ=17.9	2 CDRs, 4 LCDRs, 3 LTs
IO	$\bar{x}$=30.7 n=21 range 24-46 σ=5.1	$\bar{x}$=8 n=24 range 2-22 σ=6	$\bar{x}$=12.5 n=23 range 1-38 σ=10.0	Yes=3 No=21	$\bar{x}$=14 n=3 range 12-18 σ=3.5	1 LCDR, 7 LTs, 13 LTJGs, 1 CWO, 1 MKC, 1 civilian
Other	$\bar{x}$=29.8 n=4 range 25-33 σ=3.4	$\bar{x}$=7.9 n=4 range 5-11.5 σ=3	$\bar{x}$=34.2 n=4 range 13-72 σ=26.1	N/A	N/A	1 MSTC, 1 MST2, 1 E-5, 1 GS-5

Table 3. Percentage of Time Spent on Job Activities.

Job Activity Classification	Percentage of Time Spent By Individuals Who Used The Classification
Investigation	$\bar{x}$=66 n=30 range 29-110 σ=19
Computer Entry	$\bar{x}$=32 n=22 range 12-70 σ=13
Collateral Duties	$\bar{x}$=17 n=13 range 5-30 σ=10
Training	$\bar{x}$=13 n=9 range 5-40 σ=7

Table 4. IO Answers To Caseload Questions.

Caseload Questions	Summary Statistics For IO Answers
Open Cases	$\bar{x}$=26 n=22 range 5-56 σ=15
Most Open Cases In Last 6 Months	$\bar{x}$=32 n=21 range 6-63 σ=16
Fewest Open Cases In Last 6 Months	$\bar{x}$=15 n=21 range 0-50 σ=14
New Cases Assigned Per Week	$\bar{x}$=2.6 n=21 range 1-7.5 σ=1.6

Table 5. Open Cases By MSO/MIO.

MSO/MIO	Puget Sound	New Orleans	Morgan City	LA/LB	Baltimore	New York
Open Cases	$\bar{x}$=26.0 n=4 range 24-30 σ=2.7	$\bar{x}$=13.4 n=5 range 5-18 σ=5.2	$\bar{x}$=51.8 n=4 range 46-56 σ=4.6	$\bar{x}$=18.2 n=4 range 11-30 σ=9.1	$\bar{x}$=24 n=3 range 14-39 σ=13.2	$\bar{x}$=21.5 n=2 range 17-26 σ=6.4

Table 6. IO Self-Rating On Human Factors Codes.

Understanding of Human Factors Codes	Confidence in Human Factors Codes Recorded On The MCDD	Confidence in Human Factors Codes Recorded On The MCHF
$\bar{x}$=4.1 n=26 range 2-7 σ=1.4	$\bar{x}$=3.9 n=25 range 1-7 σ=1.7	$\bar{x}$=4.3 n=21 range 1-7 σ=1.7

Appendix C

Interview Answers to Typical Day Question

--Describe a typical day

Question 2.9: Describe a typical day.

A: come in, review cases - work on a few - prioritized -phone calls, interviews, answer messages, mail, 3 hours on computer

A: come early or late because of computer - look at in-box - new cases, new correspondence, - day timer, finish up yesterday, - need information, need Document Designer, need MSIS - computer, make calls, computer, get tired - do calls in morning - duty officer goes out of office, assigned weekly, Thursday to Thursday - hearings, once or twice a month, - 3 or 4 cases/day; come in 7 or earlier-3:30 8 or later - 4-4:30

A: grab files that I would have worked on before - search for computer terminal (seems like 50% of time) - no flexibility to wait for date aft. (system greatly improved as far as speed in last year) (if mistake, penalty was substantial wait) - don't spend much time out of the office, as little as possible and not by choice - reactive (CG investigators could be more proactive, e.g., checking out charter boat operations)

A: priority cases, PA cases, get ready for hearings, get those done ; recent hearings, updating PA cases; doing MC, personal injury and vessel casualties; phone calls interrupt flow

A: at desk or in front of computer - no subordinates -use regulations and case files at desk - start with PA cases, have most important - then look at MCs - computer work - open relationship with boss - 1 hour lunch - go home 3:30

A: come in - grab open cases (keeps book of cases, most are PA) - make notes - spend morning contacting - in afternoon, type in cases

A: get in office 6:30 - 7:30 - plan out day - what to work on - try to follow plan - stuff does arise - telephone - get on, check e-mail, message boards, search vessel in MINMOD, assignment board, problem reports - lunch

A: draft opening and closing statements for collector lab and MRO - call witnesses - find qualifications - went out on power loss - time talking to ALJ's secretary to cancel hearing - answer questions from industry on drug and alcohol regulations (they want CG's interpretation) - review message traffic - review e-mail - review PA cases - check status of calls

A: arrive at 6 - clear e-mail (45 min) answering mail - 7:30 started on cases - review in bulk - do all letters at once - all litigation packages at once - close and process cases - computer - phone calls - done by 3:30 hopefully - leave at 4-4:30

A: outstanding FOIA, get quick things out - any cases, loose ends for case work - answering phone calls, 5/6 per day, not always related - whatever comes in, respond to - case management, put stickers on front, when get cases, do everything I can, make phone calls

A: check calendar for appointments/hearings - phone calls in morning - reading in morning - in afternoon, drafting letters and MSIS input

A: assign case - ask each IO to status open cases - areas of expertise - personnel preferences - can look at cases for a couple days - can handle personnel inquiry - case hang in limbo awaiting information - assign reservists work on weekends

A: 15 min, get organized, chat - look around for a terminal (have 4) - training from 8 to 9 couple days a week (some unit wide, some department) - like to sit down fresh with computer (eye strain) until 11 - sports lunch, eat lunch, go to gym, 11:30-1 - afternoon, make phone calls, send letters - go through cases every 2-3 days - case management, go through each case and based on notes - getting information - collateral duties

A: setup "to do" list for the day and prioritize items - priorities driven by SIO - nickel/dime cases - fill in day with MC - use computer for 1 hour

A: come in 7:30 - 7:30-8:00, read mail, routings, etc. - returning phone calls - get on MSIS, 8:30 - 11:30 - lunch - answer calls - MSIS, 1:15-4:15 - straighten up - leave 4:30 at times do various other stuff- talking drugs - gathering information in field - going on anonymous call - lot of letters out, Document Designer - go to law enforcement - one month did 32 cases

A: get in about 7:15 worked on a case on the computer - did Narrative Supplement - drafted from materials - came back from lunch - wrote letter to lab about drug testing - write letter about Sweeney case - drafting some hearing materials - 4 or 5 10-minute calls per day

A: in at 7:30 - check e-mail - administrative CG mutual assistance, collateral duty, 1.5 - 2 hours - computer work, 4 hours - days when I'm on computer, I save it up - make calls to witnesses, contact - cos for paperwork reports - on duty, responding to duty calls, collision cases -

A: no such thing as typical- in at 7:15 - phone calls and gather information - casualty, 60% on-scene - civil violation, 50% on-scene, hearing, 70% office, 30% hearing out of Baltimore

A: work on 2-3 cases (phone calls, letters written, computer) - answer phones (10-15% of day) - not average, look at casualty in the field, or check out violators

A: on computer doing a case most of the day - review ship's logs - on phone for information

A: bring up computer - see mail - organize (.5-.75 hrs) - work on some cases, phone calls, send letters, enter data (4-5 hrs) - collateral (e.g., morale stuff) (1 hr) - log books

Appendix D

Interview Answers to MSO/School Differences Questions

--How IO job differs among MSOs

--How IO job differs from IO school

Question 3A11/12: **Do you ever interact with IOs (or others) from other MSOs/MIOs? If yes, how does your work differ from that at other MSOs?**
If you attended the IO course at Yorktown RTC, how does your work differ from what you were taught there?

A: more idealistic at school

A: We have more cases and wider range of cases - how they do administrative clemency cases - e.g., different at Puget Sound - some charge more readily - function of caseload

A: course teaches ideal situation; e.g., don't go out to look at damage of every case, don't know if information - hearing different, function of different ALJ; didn't see sheer volume of cases, help in management of open cases, organization model, setting up ticklers

A: Portland/Alaska ports especially different. - a lot of casualties on Washington State. ferries (they are diligent about reporting) - different in autonomy, SIO make final call

A: world is different today - don't know if there's anything to get out of a follow-on IO course; not very often

A: taught just basics, but here its going deeper - course is good at courtroom stuff and judge

A: exchange of information on particular case - notice of transfer of case - requesting assistance to locate someone - getting advice

A: here we're looking at manning issues of tugboats/towboats (not many others doing that) - enforcement actions, more conservative here - illegal activities, proactive - aggressive in investigations here

A: training regarding hearing, learned it all here - after class, didn't know what happened at hearing - need to see a real hearing (video of real hearing would be closer)

A: routinely, transferring cases, local information - rarely, to answer - the SIO has tight relationship with ALJ - others, not good relationship with ALJ, different authorities and responsibilities - can't close case without SIO

A: different levels of enforcement - set standards for enforcement

A: serving charges (e.g., found people on wanted list) - no idea about differences

A: no violation investigation at Yorktown - Yorktown didn't really teach you how to handle hearings - local SIO advocacy guide better - overall good course

A: highest volume - forced to do and not react - we do stuff for other MSOs - other MSOs "flip out" - get good training because of volume and severity of casualties

A: (at course) learn more policy, here you're actually doing it

A: communicate with other MSOs on phone - don't think work differs

A: we do more on-scene interviews and evidence collection than course does - they emphasize hearing more

A: workload here is 10 - 15 times greater - get a lot of change of venue - of course, they charge when we'd issue a letter of warning

A: more MINMOD stuff - federal rules of evidence need more coverage - more important - questioning techniques

A: communicate with other MSOs a couple of times a month - Miami does more passenger - Morgan City does more diving platform - N.E. does more fishing, more groundings, collisions

A: only occasionally - change of venue or when need to charge someone in their zone - get someone to go to drug test lab so Dr. X can give telephonic testimony - maybe a higher case load, maybe not - geography dictates types of investigations, barges, deep drafts - largest regional exam center, big PA case load - maybe more drug cases

A: SIO conference, SIO calls for various briefs, other information, share a lot of information

A: IO course spent lots of time in MC and hearing - didn't spend enough time on MSIS, MV (prob why expanding it to another week) - a lot of subjects covered, a lot not - just a lot of overviews, like public affairs - did not give us standard tools that we can use at field level (may feel MSM gives enough guidance) - learned through OJT, 40% of what they taught us at school

A: don't know, can only rely on how other SIOs (say) - MSOs not doing it right (e.g., non-valid surrender of documents)

A: don't think it (course) was realistic - drug cases handled completely differently by the ALJ

A: interact with other MSOs for change of venue or FOIA

A: IO course gave information on what references to rely on - points of contact with other IOs

A: calling for information - change of venue - sounds like other MSOs/IOs have same kinds of problems

A: communicate with other MSOs all the time - lives, offense in different area - work isn't much different - different bareboat charters to avoid inspection (make restrictions)

A: use computer more (than at course) - could be IO course on how to investigate and another IO course on how to process a case, computer - MSIS course should be follow on course for IO - IO didn't teach efficient investigation/ more professional approach - not one set way to do things / how does CG want me to do things

A: Morgan City - when in Morgan City, contacted Port Arthur, Mobile - each had own procedure

A: we exercise a lot of local judgment and policy that is not shown at Yorktown

A: Captain has empowered me to decide what gets investigated and am final authority on most investigations - the captain trusts me - different from other MSOs

A: we settle more cases - otherwise they just generally brush the basics - don't remember the course

A: don't know - contacting for help - get expertise on Sweeney case from Mobile

A: I thought totally that inspection school and IO school was on a completely different level - they get real deep into it with large vessels - they don't understand the 8th district workload - didn't touch on Sweeney - drug case - administrative clemency

A: Mobile and New Orleans - not much

A: concentrated more on big cases and going to hearing - most of our cases are more mundane

A: transfer cases - pretty much the same, all Gulf ports, different on rivers

A: "Jeez!" - good introduction - but methods they teach are on a more black and white scenario and that's just not the way it is, like " everyone's real cooperative, all witnesses present"

A: more caseload here - voluntary surrender done more - types (groundings, collisions) due to waterways

A: yesterday - no idea

A: not really - Yorktown gives the basics - you develop your own style

A: Philadelphia and Hampton Roads (traverse to get to Baltimore) - pass cases back and forth - don't talk about how they handle their cases

A: degree of complexity - real life is more complex, more in depth - in the real world people won't tell you what you want to know - MSO Baltimore more proactive on boarding and joint operations - Yorktown teaches reactive operations

A: turn over cases - don't know, assume it differs - MSO Baltimore is proactive on boardings, many aren't - some ports don't take cases to hearing (don't know how) e.g., Cleveland, Wilmington, rubber stamp cases closed without going to hearing)

A: took IO course in 1991, learned about 2692 and CASMAIN - so MINMOD is different from what I learned

A: serve subpoenas for us or work the same case - violator crosses boundaries, transfer cases - MSO Hampton Roads, different charge sheets

A: Yorktown told you there would be differences given your boss, the judges, etc.

A: Philadelphia and Hampton Roads - transferring cases and information on existing cases - don't know

A: MSIS tends to breed mediocrity - just investigate well enough to get MSIS to accept it - also no standardization in how to do MSIS (e.g., what do you fill in for "subject" (case type))

A: COTP separate from MIO, different from MSOs - I think MIO NY is better at researching cases - checks to see if any other port has opened a given case - other MSOs sometimes open a duplicate case - if subjects are not verified (VFOC), then won't show as an open case - other ports have different priorities

A: Yorktown - idealists - have all the time needed to do the cases - Yorktown - talk about getting the "truth" - in reality, you are getting lots of information and construct events - causes, never know the "truth"

A: information flow - Philadelphia, about same as here

A: we rarely go out to the field, not enough time unless it's a major casualty (might not be a vehicle available, might not be able to get CO to endorse you to stay overnight) or can't there in time to catch witnesses (e.g., to go to New Haven takes hours) - generally don't discuss case with others, generally don't interview a lot of folks - usually just get key people because several days go by between casualty and investigation, don't see equipment, etc. as it was at casualty - some cases come from Europe and MidEast

A: charged a guy for MSO New Orleans - helped IO from MSO Providence - case occurred in MIO NY area, home port in New Orleans - did duplicate cases - when compared with other MSO's (New Orleans) case, was done completely different - they were very superficial in their investigation, took 1 hour, I spent 3 days - grounding, (lots of damage)

A: transfer case information - MIO NY is a large unit (includes Europe) so have more logbooks - Maine gets more fishing vessel cases, etc.

Appendix E

Interview Answers to Investigation and Obstacle Questions

--What works best in investigation

--Major problems in investigation

--Problems in your job

--Organizational obstacles

Question 3A8: What are the things that work the best in investigation specifically?

A: I do - CG in general has authority and no problems exerting it - budget works well - generally get equipment we need - well supplied

A: empathy

A: the SIO has legal training/good head - SIO knowledgeable and able to represent Divisions activities to superiors with confidence

A: talking to people and listening (letting them talk)

A: regulations that written to enforce standard of conduct - amazing that non-lawyer can do job

A: don't need more legal training (advantage having SIO as lawyer)

A: MSM is best aid - has book that takes with, stuff like copies of charges

A: being persistent in phone calls

A: nothing else

A: just teamwork in office - high morale - helps a lot

A: good at collisions, injury, fatalities - do reasonably good at S&R - observe and sit 2nd seat before doing - teamwork; for the IOs - good being part of a team - training is regular - SME works well

A: don't know

A: teamwork - we rely on each other's areas of expertise (e.g., law background)

A: phone is a useful tool, don't need to talk face to face

A: coordination with other departments and group - logistics of getting somewhere to do something (e.g., get over to San Pedro to investigate)

A: validation by IOs, working well, costs a little paper, saving a lot of time - have life jackets now - self generated list of templates and codes

A: the IO is given lots of latitude and his judgment is used a lot - case routing is very efficient system

A: local materials, stuff in IO shop, samples (voluntary surrender agreements) forms, hearing checklist, cookbook for drug hearing - "joint stipulation of facts" works real well

A: fortunate that we have a real good SIO - that he can review - choose cases - also provide good authority

A: subpoenas - compels people to talk to you - being able to draw from various backgrounds (e.g., inspector experience, law enforcement exp from reservists) - interviewing techniques - joint M/O boardings with law enforcement

A: try to put people at ease so they'll open up and talk

A: subpoena - data bases for parties and vessels - MV set does help prosecute a case

A: good administratie staff, they open cases and prepare monthly reports from MINMOD (e.g., # cases open, # cases closed, etc,) - command's recognition of need for IOs (have 6 IOs above # of billets) - IOs have individual offices (only dept that has it, other departments have bullpen offices) - have 3 IOs with prior background as attorneys, good at helping other IOs train for hearings - 30-40% of work is in violations and hearings - HQ staff (Jim Law, Pete Jensen, Steve Sheek) very accessible and supportive

A: most IOs know how to talk to people and get to the truth

A: interaction/discussions with other IOs - experience as an inspector

Question 3A6: What are your major problems in investigation specifically? Suggestions for improvement.

A: needs to be more psych interview techniques - MSIS - lack of direction - system is just so redundant - we don't see the results - what purpose it serves - what's the result

A: endless loop of looking for Human Factors; not value added in identifying many HF codes

A: none

A: getting information (good,reliable) - e.g., type of information submitted from public

A: finding people that need to talk to - people too busy to talk to CG

A: finding the people - no authority to track down people

A: MINMOD - MCPC, if don't have IPN# can't get out to get it - people don't get stuff in on time

A: none, really

A: locating people - companies can't check with CG to check personnel

A: MV cases take too long - pulled in many directions at once, need to know a wide variety of cases - having so many cases -S&R, not having inspection qualifications - inordinate time on MINMOD

A: for the IOs - timeliness of reporting of 2692 - availability of witness - lack of cooperation from parent company - failure to do drug tests - incomplete 2692

A: nature of military organization - rapid turnover of personnel - temporary assignment - how to play catch up in MSIS, policy, etc. - looking to produce IO bible, started with changes in policy for reservists; for the IOs - don't have good investment for IO trainees because they only stay 9 months (3 weeks to 4 weeks for the IO course is not a good payback)

A: finding mariner - across the board - nomads - might send reservists to find them (do most of work in office) - most are out of our control

A: MSIS - lack of inspection background - get 2 week training

A: uncooperative people, won't respond, lie - then just have to ask someone else

A: "working with product sets is combative" - "think ahead to what computer is going to want" - OJT for computer gets messed up - something better than what comes down on mailbox as to product set priorities - get information on mailbox, sometimes slips by - get disseminated

A: lack of expertise, lack of funding to obtain it

A: MINMOD - more apparent power than real power (e.g., subpoena) , but can bluff it pretty good

A: use to have worse relations with Port Ops and Inspections, better now - availability of automobile to go out to field

A: in this location, physically getting to these places where stuff happens - vehicle availability - actually just got 2 or 3 so no longer a problem

A: getting in touch with people you need to

A: too many cases - some are 3rd generation inherited from other IOs- unwieldy

A: computer entry - how to get the right information in there - fewer choices?, too many choices leaves it open to interpretation; for the IOs - training and computer - shifting gears between cases - MC cases can lag - S&R have court dates to work to - can receive priority - MCDI, delayed investigation log, try to finish cases so they don't end up on the log

A: none

A: lack of subpoena authority in pure violation cases - need to spend much more time (sometimes undercover) to get information - MINMOD, PA set is a hindrance, adds no value to ability to process a case and have to modify actions (e.g., bogus charge sheets) - PA, need flexible charge sheet that can be printed and used - now do it in Document Designer

A: computers, not enough of them - computers usually busy in IO dept, so hike down the hall. often leave need pieces of data at your desk - no laser printer in IO shop, it's down the hall, so walking back and forth to put paper in, hit "Go", etc. -training, don't have enough background for certain things (navigation instruments, pilot movements) - prior assignment on CG cutter or training (MITAGS) on nav system - ride with bay pilots

A: training for IOs - not everybody can go to IO school - or can't go immediately - resources budget (computers, CFRs) - can't expect them to do their jobs without training and resources - trainees get paired with more experienced IOs - would like CFRs on CD-ROM to make it easier to do search of CFRs pertinent to case - trouble getting to the scene - no boats at MIO, have to get help from group, sometimes - lack of support from HQ or ALJ or District - sometimes they will do the expeditious thing instead of enforcing regulations - Budget, have to pay for court recorder - ALJ, bends over backwards to appease other attorneys

A: depth of experience of IOs - would like experienced INSPECTORS for IOs - IO is not "glamorous" - don't get a lot of folks who want to do it - increase # of inspectors

A: slow response time in correspondence with people I need to contact - I write letters to shipping company, coroner, witnesses, etc. - can take months to get letter/reports back

Question 3A5: What are your major problems in your job? Suggestions for improvement.

A: lack of computer, necessary to do job , getting on computer; get additional training after IO course, advanced investigative techniques; no trouble getting funding; skills in advanced investigation technique, interviewing/determining the truth, public speaking/customer service

A: amount of time and workload (no money for overtime; comp time) - get another IO - "eyes and ears of MSO, but we're not out looking" - e.g., what is tugboat manning - could send out IOs to investigate

A: we're supposed to conduct hearings and we're not lawyers

A: locating people - companies can't check with CG to check personnel

A: MV cases - lack of experience, inspection particularly - lack of funding for quality training - fighting MINMOD

A: for the IOs - pulled in many directions at once, need to know a wide variety of cases - having so many cases -S&R, not having inspection qualifications - inordinate time on MINMOD

A: MSIS - continuing series of minor problems - sent out lessons learned on e-mail - lack of familiarity with field investigation; for IOs - frustration with MINMOD - no good documentation, no training - frustration that PA cases take so long - frustration with PA cases where guy skips town

A: different boss rotating, different styles, different expectations from SIOs

A: inconsistency, each case is unique, no template - can't always decide what should be done on a case - suggested that powwows held and consensus reached, everyone on same wavelength

A: getting information from witnesses - not in training as much as just getting information from them - familiarity with what HQ wants from the field from the computer system - what's the point of the data - what's important to the case - not getting to bottom of things - inspectors have other courses to sharpen their skills - police have lots of training on tactics, interviewing - a lot of short course police give - sharpen our skills in IO - "Professional Boat Builder" - accident investigation course

A: don't have video camera - only had 3 computers for 6 IOs, better now - short one office - every IO needs an IO bag (only 1 IO bag for whole office)- need own forms - no extra cameras, full size cassette recorder, not mini recorder

A: Yorktown, 8 wks inspection, 7 wks Port Safety, only 3 wks for IO, need more emphasis on investigations - hard to live up to program expectations with so little training - no learning period on the job - levels of investigation qualifications, MC, civil penalty, S&R, work your way up

A: degree of legal knowledge - often going against professional lawyers - dealing with people and trying to get information - comes with exposure - training probably wouldn't help

A: computers, not enough of them - computers usually busy in IO dept, so hike down the hall. often leave need pieces of data at your desk - no laser printer in IO shop, it's down the hall,

so walking back and forth to put paper in, hit "Go", etc. -training, don't have enough background for certain things (nav instruments, pilot movements) - prior assignment on CG cutter or training (MITAGS) on nav system - ride with bay pilots

A: training for IOs - not everybody can go to IO school - or can't go immediately - resources budget (computers, CFRs) - can't expect them to do their jobs without training and resources - trainees get paired with more experienced IOs - would like CFRs on CD-ROM to make it easier to do search of CFRs pertinent to case - trouble getting to the scene - no boats at MIO, have to get help from group, sometimes - lack of support from HQ or ALJ or District - sometimes they will do the expeditious thing instead of enforcing regulations - Budget, have to pay for court recorder - ALJ, bends over backwards to appease other attorneys

A: slow response time in correspondence with people I need to contact - I write letters to shipping company, coroner, witnesses, etc. - can take months to get letter/reports back

Question 2.12: Are there any things in the organizational structure of this MSO or the Coast Guard that keep you from being the best IO that you could be? Yes No. If Yes, describe. Suggestions for improvement.

A: lack of equipment - automobiles - would do more proactive type things - MSIS prevents from doing best job I can

A: good communication within unit - doing data entry, would like to do things locally and then all sent to mainframe (speed things up)

A: need a computer - good boss is motivating - lower standard without constraints

A: MINMOD not user friendly - only 1 car in office, need more, money is a problem, like no travel funds, not enough for computer , Commandant's moratorium

A: the fact that I don't have inspection qualifications - and that I'm not a lawyer - also lots of New Orleans lingo that is hard to learn

A: a lot of times you don't know it's unsafe until you get there - especially in drug cases - not much to do about it

A: more training (funding) - IOs working on computer when could be investigating - manuals not up-to-date - placing people as IOs before they have inspection qualification, important - they're off once they learn how to investigate - should civilianize MSO

A: 1. turnover, experience level, rarely get someone as experienced IO, come primarily as marine inspectors, most on 2nd or 3rd tour; 2. Investigation is an afterthought, unwanted bastard offspring; 3. perception in HQ that MMI is a useless unresponsive organization - can't answer questions - the best and brightest aren't in MMI

A: feedback, more, and both positive and negative - more training definitely (act like mini-lawyer, basic understanding of law, individual time (1-2 hours /week, baptism by fire) - computer training sufficient - mentor/trainee program

A: would like flex time, have active duty on weekend, but get squelched, to enhance use of computer - some collateral duty will come and disrupt "real job", has impeded work - go to IO school after 50% of time as IO has been spent

A: adversarial relationship of military vs flow and getting information - things routed based on rank, not on experience - a lot of time put into cases that... think CG should civilianize some duties, inspections, investigations, military holds people back - not like business where premier people can have an impact

A: lack of more outside training - lack of adequate unit funds to take advantage of local training

A: SIO gives us a free hand and is available for assistance - hope somebody has a use for the insignificant BS we're talking about

A: problem in New Orleans on advance notification - lots of Ops people don't really know M (Marine Safety) - Admin Clemency is kind of vague - hard to know criteria - regulations vs policy letter - training fixes - Part 16 is getting older - problems needs to be updated, put policy letters into regulations

A: if something comes up there are avenues to change it

A: resources, vehicles, training, could use more (e.g., rec boating) - mainly matter of experience - new CFRs - if load was lighter, more likely to get good information on every case - could use more IOs - could get into hearings more - and more complex cases

A: G-MMI assumes MEP and IO shops together, in reality they are usually split - MINMOD needs to allow teams to work on case, don't lock out changes, review process can bring up new ideas

A: Investigation Dept should include Port Ops (oil spill, civil penalty)

A: haven't seen any problems yet

A: IOs should have inspection experience (currently have 3 lawyers as IOs - no inspection experience) - IO billet does not get the credit it deserves - CG must prevent, not just react - IO billet not recognized as important - had to fight a few years to get >2 IO billets, had 1000 case backlog - now have 300 cases open, 5 billets, but 11 SIO/IOs- lack of standard workstation - have almost 1/IO (only 1 person without computer), computers in offices, had to fight for computers

A: management - it's taken a year to learn the job - IO school was a farce - helped a little, but not nearly enough time on MINMOD - spent 17 years in field/operations - IO is a whole different environment - not many experienced IOs - keep people in IO job at least 1.5 years to increase experience base

A: haven't been able to go to Yorktown (not enough billets available) - not enough computers for everyone to have one

Appendix F

Interview Answers to Human Factors Definition Question

--What is your definition of Human Factors?

Question 3B1: What is your definition of human factors?

A: people analysis, person's behavior

A: "experience and training on how to deal with certain things"; "sort of like common sense, e.g., farmer vs. city person"; people didn't have experience under certain conditions and things

A: Problem caused by something a person did or didn't do. Something person has control over.

A: not one of the other factors (tricky that weather is not only weather, but other conditions)

A: what role does man play when looking at a casualty - what some individual did - indifference, lack of concern, awareness - that may have contributed to the casualty

A: decisions that people make that lead to to MC and why they made those decisions

A: anything dealing with public relations, dealing with people - taking into account that everyone's different - taking into account on a case by case basis - the individual who's involved

A: something you do to cause something, or in design that prevents you from doing your job effectively and safely

A: error in judgment - didn't assess situation - wasn't aware - wasn't knowledgeable

A: training, experience, physical ability, work/rest, job stressors

A: a circumstance caused by a human that resulted in a casualty - lack of training, negligence, error in judgment

A: element of chance that a human involved in some step of a process will make the correct action

A: outside and inside influences which affect judgment or ability to respond to navigation and safety of vessel. e.g., (noise, fatigue - outside)(drugs, alcohol - inside)

A: human action, reaction, or lack of action driven by all information available to that person at the time of that snapshot incident

A: something an individual did or didn't do rather than him being a victim of surrounding circumstances

A: factors where human actions intervene in a sequence of events

A: "are actions/inactions of individual that contributed to casualty" - could also be physical, but usually in mind

A: human performance criteria - directly related to job and how they perform their activities - adding up all HF makes the job - all things they have deal with job and influence how they do things - all things that directly affect their jobs

A: personal actions and thought and physical abilities all wrapped into one - skills, judgment, education

A: the MCHF supplement

A: stupidity - blatant violation is stupidity - drinks - human response, but in the human response stupidity shows up

A: the actions or inactions of people which contribute to marine casualties or incidents

A: any kind of effect that a person's actions can have on the outcome of an incident

A: human element in marine casualty

A: something a human did that was a contributing or primary cause

A: things people do to cause or react to situations

A: factors which, by default or by design, vary with the introduction of different people into the situation - personality, fatigue, visual acuity, size/shape, etc.

A: "90% of problems" wrong assumptions, actions without thinking/evaluating - mental mistakes - pushing green button instead of red button - anything not a mechanical error

A: human element contributed to casualty - from negligence, violation of law, to inadvertent omissions (like forget preventative maintenance)

A: human component - which either acts or omits acts and cause problems

A: machinery and environmental factors did not cause it - human error

A: human error (e.g., steering gear broke - could be manufacturing defect or maintenance problem - human error)

A: something that a person did to be responsible or related to an incident

Appendix G

Interview Answers to Determining Causes Questions

--How do you determine root causes?

--How do you determine human factors causes?

Question 3A15: How do you determine root and contributing causes (i.e. causal/enabling factors) of casualties? What methods do you use? How do you decide to look beyond an initial, obvious cause? Do you usually identify multiple causes? How many "causes" are enough?

A: thru interviews, material condition of vessel, housekeeping, training documents, how well job known, knowledge of job, emergency procedures, look at chain of command - bridge management team - use chart from Loss Control Institute Course - SCAT - Systematic Cause Analysis Technique

A: primary cause and not go beyond; gets comments from SIO, why; does that make sense?

A: go through possible entries of MSIS and pick the best - MSIS phrases don't have definitions - need handbook of what the terms mean (sentence of what it means, phrase) - informal dialogue with staff and with SIO - don't look back at past examples

A: information, what happened, what systems involved, how does system operate - once you know how system works, can look for causes - big picture and then components of big picture

A: gather information, chain of events that make sense, come up with hypotheses, don't test hypotheses rigorously - if can do in head, do it - when need to test hypotheses with PA, test rigorously - 4 times (seriousness because someone will get..., 1 time, high media interest)

A: talk to as many people as I can - don't talk to key people every time, usually find out best information from deckhand - ask why or how it could have been prevented - persistent with it

A: usually from just asking questions, answers lead to more questions, try to exploit those - sit back, review, see if anything is missing or needs clarification - repeat back to check - need to do with a bunch of people - ask questions a couple of different ways - examine the vessel - have them plot course - getting physical evidence - rely on inspectors, survey, salvage

A: research and interviewing - information from 2692 -"in your opinion what caused this to happen"

A: physical evidence compare statements - any advantage to be gained? - documented conflicts among individuals - just keep looking until it feels right - anything that doesn't fit - use cause analysis chart from LCI course

A: use "why" technique - feedback from other IOs, CO, XO, SIO, ASIO

A: no particular formula or method - largely based on prior experience - no uniform training or cadre of professional investigators

A: ask yourself why did it happen? - vary from case to case - equipment failed, anyone responsible for maintenance - acquired by doing, focus on certain aspects from experience - being inquisitive

A: only see a few kinds - hard to know how I find a cause - identify single cause unless obvious, then have 2 causes - don't know when to X MCHF - just whatever boss wants to do

A: no experience - based on interviews

A: ask a lot of questions, very subjective - get ideas for common causes - most things don't happen from a single cause, usually put down two causes - some physical cause and lack of awareness

A: make no judgments until you've talked to everybody - talk to everyone first - lay out notes in front - logic formula - look for established things that they should have followed, what did they do, and what are the differences - stop looking at causes when it goes beyond scope of that person's duty

A: questioning technique - do like police do - question peripheral first before primary - use information to get truth - evaluate physical evidence against statements - (e.g., paint curl revealed truth)

A: go into MCDD - put in question marks in each one - do supplements - investigate until you're comfortable with it- don't let gut feeling interfere - fact gathering

A: look at work practices - ask other boat captains - look at regulations - safety practices of the company vs. common sense vs. regulation - limits on equipment - autopsy reports

A: try to ask good questions - always helps to go to scene immediately - meet them at the dock - take pictures - good questions are relevant - know regulations - inspection background comes in handy here

A: start from the end and work backwards - collision example - start with guy who got hit - then go to guy who did the hitting - they're both doing it (fudging truth) and you have to talk to both to figure it out - if they agree and are satisfied then that's great - no need for witnesses - people don't want to tell you stuff - good if you can excite them a bit and then give them a chance to tell the truth

A: still trying to learn - my impression is that a lot is common sense - break out main events - chronological sequence of major events - rely on specific expertise - this is where inspections helps out - better insight with casualty (e.g., force required to achieve damage, holes in chain locker not a big deal) - lots of common sense

A: collects informtion - analyzes - look for conflicting information - try to figure out timeline (in IOs head, not on paper) - try to get multiple causes/root causes - seldom see MC with only 1 cause

A: experience - find out who the experts are (e.g., technical experts for a steering casualty) - equipment failures - can get a series of events/causes - easier to identify multiple causes - have hard evidence to look at - human factors - harder to trace back, because have to depend on people to describe (truthfully and fully) what happened - have to dig more

A: (sounds like they do ask questions to get back to root causes, don't dig for root causes if there doesn't appear to be anything to learn/gain from it)

A: believe in one cause - one cause that would have prevented the accident - other things along the chain of events are not considered causes but an enabling factor (have not yet done these in MINMOD) I do document contributing causes in MCNS

A: look for one deciding factor as the primary cause - look at the facts - must be black and white - most/all cases have multiple causes

A: have 6 months training schedule - IOs get assigned a topic and make a presentation on it - one topic is apparent causes - teach allowed events in MINMOD, each event is caused by something - another event or by HF, EF, WX etc. - SIO bounces back cases with incomplete events/causes - almost everything has HF causes - most of case probably show single cause

A: usually find one central aspect, which has subcomponents causes, usually a "concert of causal factors"

A: look harder for collision, grounding, explosion then for personnel casualty/injury (slipped and fell), single cause, 20% multiple causes - 5% multiple events

A: intuition, experience, common sense - usually find single event, single cause - some are multiple event, multiple cause, but often not a cause for each event

Question 3B3: How do you come up with human factors causes or contributing factors? How does that process differ from determining equipment factors or other factors?

A: does differ, equipment is simplistic, human being is more complex - for contributing, will go back to company - training documents, history - use SCAT

A: personal injury has a lot of HF causes; still learning the best way to get that information from people

A: equipment factors (or others) are more evident; takes more time to get to the HF, don't always take that time; personal injury - always

A: based on each circumstance - lot of diagrams - was there really a bad current or was the guy just drunk? - look at factors equally, fine line between all of them, an equipment failure could be an HF - use historical data on performance

A: process does not differ

A: if the information is there, then I go ahead with it - the HF in MSIS is very limited - leads to inaccurate report because of limited class and subclass

A: "could I have made this same decision and why?"

A: doesn't differ - "why" technique - have to delve deep - training

A: doing very superficial personnel injury cases

A: equipment is easily recognizable - if guy bangs knee, it may be obvious its HF, but if ship rolls, then its weather - some you never know

A: intend for training - many factors are similar, and many factors aren't in computer and you have to pick something cause - usually for equipment, guy will blame equipment, but he won't blame himself - you have to get that information from someone else

A: more effort to come up with HF causes - take them for granted - industry is tough, ships are so different, controls are just overlooked - different ships, different officers, take flexibility for granted, IOs just assume negligence, don't consider how difficult it is for mariners

A: you can't look in a human mind, have to go on what they tell you - they may tell you multiple things - I think I can tell when someone is lying - body language - some people have more experience and they can do it, thats why we have good IO shop, Jim Wilson, Paul Albertson, Scott Stewart , (me), all prior enlisted - got to be a curious guy

A: main way is fall back on my knowledge, what I've seen in past 5 years of marine safety - apply common sense - what does the majority of the evidence support? - equipment factors are cut and dried whereas mariners have 2 or 3 conflicting stories - have to weigh the evidence

A: if a guy made a mistake - what's his responsibility there - what's he required to do rather than what he did - somebody must have done something somewhere along the line

A: no differences - ask whatever questions are needed

A: different people's stories don't jive or different from equipment results - look for signs of nervousness - check person's story a week later to see if it's changed

A: seems like it kind of presents itself - equipment factor are evidence (technician can see broken parts, etc) - try to read the person's mind to determine the sequence of decision processes

A: look at data and try to identify events and causes - then try to make it fit the codes - probably are a lot of HF errors missed because not trained in HF, example is communications, both verbal and non-verbal

A: use top of HF supplement to remember to get age, height, weight, etc. - try to determine physical/mental influence - don't ask any special questions

Appendix H

Interview Answers to Taxonomy Definition Questions

--Definitions and Examples of MCDD Human Factors Enabling Factors

--Definitions and Examples of MCHF Classes

(Note: The answers to each of the two questions are organized and presented in two ways. The first presentation for each question is by individual respondent. The second presentation for each question is to list all definitions and examples for each class separately.)

Question 4.15: Give example for each enabling factor:

a. Cont Execution _____
b. Cont Strategy _____
c. Nav Execution _____
d. Nav Strategy _____
e. Sit Assessment _____
f. Sit Awareness _____

(Answers presented for each individual respondent.)

A: a. don't know or use
b. don't know cont - overall strategy
c. rules of the road violation - failure to use nav gear
d. don't know
e. don't use - once or twice - not assessing weather properly
f. don't know

A: a. don't know - haven't used
b. don't know - haven't used
c. guy misjudging buoy - larger vessel nav
d. picking wrong strategy
e. take everything into account trying to decide what to do
f. not being aware of a tug coming up behind

A: a. don't know what Cont means
b. don't know what Cont means
c. wait too long
d. poor planning
e. once you're in, knowing what's going on
f. before you get in area, seeing what really goes on

A: a. never use contingency plan
b. never use contingency strategy
c. grounding by being too close to buoy line
d. overtaking and gets sucked out
e. personnel casualty
f. cargo loading - don't know - get hit

A: a. don't know about contingency execution
b. don't know about contingency strategy
c. how a maneuver is performed
d. what he planned to do based on the given situation
e. overestimate strength of current
f. awareness of current, wind, etc.

A: a. not familiar
b. not familiar
c. not familiar
d. not familiar
e. not familiar
f. not familiar

A: a. master or pilot thinking correctly but giving wrong command
b. e.g., what do I want to do - thinking through a passing agreement
c. where cont strategy doesn't work - lining up with a bridge in high water
d. hard to separate from cont strategy - like sailing over mudbank with out of date chart
e. not paying attention to other vessels operating in area, weather conditions, river currents
f. not even knowing to pay attention to what you should know - like not having radio on to hear warning

A: a. I know what to do, but didn't do it right
b. term is logically non-consistent
c. helmsman to steer right
d. based on communication, like port-to-port passing
e.
f. information is available and acting on that

A: a. continuous execution - don't know meaning
b. continuous strategy - don't know meaning, never used it
c. navigational execution - used for someone on bridge
d. navigational strategy - used for someone on bridge
e. situation assessment - don't see difference between this and Sit Aware
f. situation awareness - don't see difference between this and Sit Assess

A: a. don't know
b. don't know
c. navigable execution - rules of the road?
d. navigational strategy
e. assessment of situation
f. situation awareness

A: a. can't remember what cont means - how he did it
b. plan of what to do
c. navigation of a vessel
d.
e. situation assessment - sized up facts correctly
f. awareness - perception of surroundings

A: a. continued execution - continued to steer in wrong direction
b. could guess - would have to look up
c. navigation execution - laid out course and did it
d. navigational strategy - planning phase
e. situational assessment - assessed it as to what they (were doing)
f. situational awareness - awareness of what they were doing

A: a. other than nav., lifting a drill pipe mistake
b. error in the process of how to lift the drill pipe
c. failure of ability to control the vessel in heavy sea, lot of current
d. error in decisions as to which side to go on
e. a worker knows he should wear a harness but doesn't - didn't assess danger
f. doesn't realize the danger

A: a. don't know
b. don't know
c. turning the wrong direction
d. planning out the turn
e. pumped water into engine room
f. didn't know radar wasn't operating correctly

A: a. don't know, don't use
b. don't know, don't use
c. grounding, allisions, collisions, fishing boat getting sucked in
d. more like hitting a dock - contemplating backing into a slip, should have done something
e. knows it, does it anyway
f. does not realize potential situation

A: a. can't remember what cont is - executed wrong when navigating, didn't turn sharp enough
b. strategy was wrong - didn't realize need to turn sharp, planned wide turn
c. just like cont execution
d. just like cont strategy
e. assessed incorrectly from what it is - not enough room to get thru narrows
f. weren't aware of certain requirement or ignorant of procedure - master sleeping when in charge

A: a. knows what he's supposed to do, but errs in execution (non-nav)
b. when his plan of execution is incorrect or imprudent (non-nav)
c. similar to Cont Execution but deals with Nav
d. similar to Cont Strategy but deals with Nav
e. lower level - somebody errs in judgment of a situation - misjudging current
f. somebody doesn't fully realize environment or extent of the situation

A: a. ?
b. ?
c. time of a turn
d. course to steer
e. analyzing the running lights of a vessel
f. knowing locations of charted obstructions

A: a. steering to port instead of to starboard
b. early turn
c. command to turn port instead of starboard
d. command to turn early
e. misjudging wave height
f. turning abeam in heavy swells

A: a. ? continuity
b. ?
c. turned at wrong time
d. chose wrong course to follow
e. failed to determine closing situation existed
f. did not know other vessel was present

A: a. turned left when should (knew) to turn right
b. didn't know to turn right
c. misread compass/chart and acted on misreading
d. read chart correctly, then made wrong decision
e. misread a situation
f. should have read (attempted) to read situation

A: a. doing contingency plans
b. contingency planning
c. doing something wrong in nav or piloting
d. planning on doing something wrong in nav or piloting
e. proper planning for contingencies in surrounding
f. being aware of surroundings or situation

A: a. continuous - ongoing evolution - cargo ops
b. ?
c. turn in channel or turn to next range
d. plan to execute turn in channel
e. interpretation of nav information range markers
f. stepped off side of vessel because didn't know gangway removed

A: a. continuing
b. helmsman failed to execute a helm command
c. "in extremis" incorrectly identified
d.
e. failed to properly assess "in extremis" situation
f. unaware of other vessels in area, resulted in collision

A: a. how you do it, open valve
b. how you plan it, to open valve
c. how you do it, enter channel, make turn
d. how you plan it, chart it out
e. how you assess the situation, fire
f. your awareness of all involved, to fight fire

A: a. moving wrong lever/wrong direction with helm
b. misinterpreting/predicting wrong vessel response
c. passing on wrong side of buoy
d. trackline on wrong side of buoy/channel
e. improper understanding of given condition
f. not knowing what the actual conditions are

Question 4.15: Give example for each enabling factor:

a. Cont Execution _____
b. Cont Strategy _____
c. Nav Execution _____
d. Nav Strategy _____
e. Sit Assessment _____
f. Sit Awareness _____

(Answers presented for each class.)

a. Cont Execution

a. ?
a. ? continuity
a. can't remember what cont is - executed wrong when navigating, didn't turn sharp enough
a. can't remember what cont means - how he did it
a. continued execution - continued to steer in wrong direction
a. continuing
a. continuous - ongoing evolution - cargo ops
a. continuous execution - don't know meaning
a. doing contingency plans
a. don't know
a. don't know
a. don't know - haven't used
a. don't know about contingency execution
a. don't know or use
a. don't know what Cont means
a. don't know, don't use
a. how you do it, open valve
a. I know what to do, but didn't do it right
a. knows what he's supposed to do, but errs in execution (non-nav)
a. master or pilot thinking correctly but giving wrong command
a. moving wrong lever/wrong direction with helm
a. never use contingency plan
a. not familiar
a. other than nav., lifting a drill pipe mistake
a. steering to port instead of to starboard
a. turned left when should (knew) to turn right

b. Cont Strategy

b. ?
b. ?
b. ?
b. contingency planning
b. continuous strategy - don't know meaning, never used it
b. could guess - would have to look up
b. didn't know to turn right
b. don't know
b. don't know
b. don't know - haven't used
b. don't know about contingency strategy
b. don't know cont - overall strategy

b. don't know what Cont means
b. don't know, don't use
b. e.g., what do I want to do - thinking through a passing agreement
b. early turn
b. error in the process of how to lift the drill pipe
b. helmsman failed to execute a helm command
b. how you plan it, to open valve
b. misinterpreting/predicting wrong vessel response
b. never use contingency strategy
b. not familiar
b. plan of what to do
b. strategy was wrong - didn't realize need to turn sharp, planned wide turn
b. term is logically non-consistent
b. when his plan of execution is incorrect or imprudent (non-nav)

c. Nav Execution

c. command to turn port instead of starboard
c. doing something wrong in nav or piloting
c. failure of ability to control the vessel in heavy sea, lot of current
c. grounding by being too close to buoy line
c. grounding, allisions, collisions, fishing boat getting sucked in
c. guy misjudging buoy - larger vessel nav
c. helmsman to steer right
c. how a maneuver is performed
c. how you do it, enter channel, make turn
c. "in extremis" incorrectly identified
c. just like cont execution
c. misread compass/chart and acted on misreading
c. navigable execution - rules of the road?
c. navigation execution - laid out course and did it
c. navigation of a vessel
c. navigational execution - used for someone on bridge
c. not familiar
c. passing on wrong side of buoy
c. rules of the road violation - failure to use nav gear
c. similar to Cont Execution but deals with Nav
c. time of a turn
c. turn in channel or turn to next range
c. turned at wrong time
c. turning the wrong direction
c. wait too long
c. where cont strategy doesn't work - lining up with a bridge in high water

d. Nav Strategy

d. based on communication, like port-to-port passing
d. chose wrong course to follow
d. command to turn early
d. course to steer
d. don't know
d. error in decisions as to which side to go on
d. hard to separate from cont strategy - like sailing over mudbank with out of date chart
d. how you plan it, chart it out

d. just like cont strategy
d. more like hitting a dock - contemplating backing into a slip, should have done something
d. navigational strategy
d. navigational strategy - planning phase
d. navigational strategy - used for someone on bridge
d. not familiar
d. overtaking and gets sucked out
d. picking wrong strategy
d. plan to execute turn in channel
d. planning on doing something wrong in nav or piloting
d. planning out the turn
d. poor planning
d. read chart correctly, then made wrong decision
d. similar to Cont Strategy but deals with Nav
d. trackline on wrong side of buoy/channel
d. what he planned to do based on the given situation

e. Sit Assessment

e. a worker knows he should wear a harness but doesn't - didn't assess danger
e. analyzing the running lights of a vessel
e. assessed incorrectly from what it is - not enough room to get thru narrows
e. assessment of situation
e. don't use - once or twice - not assessing weather properly
e. failed to determine closing situation existed
e. failed to properly assess "in extremis" situation
e. how you assess the situation, fire
e. improper understanding of given condition
e. interpretation of nav information range markers
e. knows it, does it anyway
e. lower level - somebody errs in judgment of a situation - misjudging current
e. misjudging wave height
e. misread a situation
e. not familiar
e. not paying attention to other vessels operating in area, weather conditions, river currents
e. once you're in, knowing what's going on
e. overestimate strength of current
e. personnel casualty
e. proper planning for contingencies in surrounding
e. pumped water into engine room
e. situation assessment - don't see difference between this and Sit Aware
e. situation assessment - sized up facts correctly
e. situational assessment - assessed it as to what they (were doing)
e. take everything into account trying to decide what to do

f. Sit Awareness

f. awareness - perception of surroundings
f. awareness of current, wind, etc.
f. before you get in area, seeing what really goes on
f. being aware of surroundings or situation
f. cargo loading - don't know - get hit
f. did not know other vessel was present
f. didn't know radar wasn't operating correctly

f. does not realize potential situation
f. doesn't realize the danger
f. don't know
f. information is available and acting on that
f. knowing locations of charted obstructions
f. not being aware of a tug coming up behind
f. not even knowing to pay attention to what you should know - like not having radio on to hear warning
f. not familiar
f. not knowing what the actual conditions are
f. should have read (attempted) to read situation
f. situation awareness
f. situation awareness - don't see difference between this and Sit Assess
f. situational awareness - awareness of what they were doing
f. somebody doesn't fully realize environment or extent of the situation
f. stepped off side of vessel because didn't know gangway removed
f. turning abeam in heavy swells
f. unaware of other vessels in area, resulted in collision
f. weren't aware of certain requirement or ignorant of procedure - master sleeping when in charge
f. your awareness of all involved, to fight fire

Question 4.18: Give example for each HF Class:

a. Communication _____
b. Knowledge/Proficiency _____
c. Management _____
d. Mental Influence _____
e. Physical Influence _____
f. Rules, Regs, Policy _____
g. Stat Signals/Indicators _____

(Answers presented for each individual respondent.)

A: a. radio lack of knowledge - improper use - no sound signals
b. unlicensed person - inexperienced person with con
c. never used - don't know what it is
d. never used - don't know what it is
e. never used - don't know what it is
f. rules of the road violation
g. engineering casualties - watchstanders fail to hear an alarm

A: a. if didn't have comm, e.g., how they're going to pass
b. how long been on job - how much they know
c. how well they manage a situation - e.g., taking on barges
d. any mental problems hindering
e. any physical problems - handicap
f. how well they know them, if at all
g. use any signals (e.g., whistles)

A: a. lack of or incomprehensible
b. how much he knows, how well he can do it
c. boss says to do something they shouldn't have done
d. goes back to management? - don't really know
e. fatigue, drugs, how located, vision
f. didn't understand them, company policy conflicts with regs
g. don't know what Stat Signals means - bulb burns out, where located, flashing red

A: a. when not talking on radio to each other
b. only had license for short period - didn't have good knowledge of towing
c. cargo management
d. never used
e. never used
f. didn't follow rules of the road
g. never used - don't know what Stat stands for

A: a. ability to communicate efficiently with crew and other vessels
b. ability to make correct decisions
c. how to prioritize threats
d. stress, also company stress
e. hours on watch - drugs/alcohol - injuries - disability
f. company and CG - company policy causes imprudence
g. don't really know statutory - layout of operating station

A: a. not familiar
b. not familiar
c. not familiar
d. not familiar
e. not familiar
f. not familiar
g. not familiar

A: a. failure to establish meeting agreement
b. pilots erring based on shoaling
c. guideline that you will get underway on time no matter what
d. fatigue, drug/alcohol, stress that leads to distraction
e. drugs/alcohol, age, weight
f. ignorance of, casual disregard of
g. traffic lights on river, engine room equipment displays

A: a.
b.
c. what is that?
d.
e.
f.
g. not sure statistics? status? wouldn't use it if I can make it fit into another class

A: a. never used it
b. have used it - when skipper does something wrong - should know better
c. don't know
d. never used it - subclasses explain it
e. never used it - subclasses explain it
f. never used it - violated rule of road
g. never used it - don't know

A: a. audio, verbal, visual
b. self-explanatory
c.
d. intoxicants?
e. disabilities
f. violated or adhered to
g. don't know - aids to navigate

A: a. difficulty in getting word to somebody
b. person didn't know - training/experience - did his best
c. seaman messed up and mate didn't tell him what to do
d. mind wasn't in on it - upset
e. sick
f. did something wrong - erroneous Standard Operating Procedure
g. malfunction in idiot light

A: a. comm between ship to ship, talk to anyone
b. person doing something related to incident
c. ship's officers, persons in charge
d. how much sleep, sharpness, quick, cold medicine, how fast they're thinking
e. lifting heavy objects and then body gave out
f. tankerman failed to comply with transfer procedures
g. if remember correctly, warning sounds signals

A: a. radio comms - misunderstanding of verbal order
b. somebody doesn't have enough skill
c. problems on behalf of company - management's fault
d. intimidation - drugs/alcohol - mental, emotional problems
e. health - vision - hearing - language barriers
f. CG rules - industry rules - local laws - mfr instruction - not followed
g. warning signs - obstruction light - warning beeper on radio - bridge alarms

A: a. radio quit working -captain told mate something and mate misunderstood
b. average grounding
c. company sends 800 HP tow thru Wax Lake Cut for 3rd time this month - office types
d. distracted
e. guy puked all over the radarscope - drugs
f. rules of the road violations
g. don't know - or use

A: a. fails to make passing agreement
b. shrimp boat passing OSV gets sucked in
c. company not providing proper equipment
d. drugs/alcohol - cut hand on Tony seasoning
e. went to sleep - hit boat
f. doesn't check into VTS as he leaves dock
g. hit a platform in a fog - indicator was not followed - not used a lot

A: a. radio doesn't work
b. didn't know what he was supposed to do - couldn't deploy life raft
c. similar to supervision mistakes - tells employee to go to winch instead of to raft
d. nervous, sleepy, disoriented, seasick
e. injured, seasickness, didn't have strength
f. failed to follow - e.g., master doesn't follow procedure
g. don't know stat - didn't turn signal lights on

A: a. rarely used missed communication or misunderstanding
b. no idea - use when guy does something wrong with a task
c. control of the situation - person making decisions tells someone else to do wrong thing
d. complacency - over or underestimating - gets to Sit Assess
e. intoxicated, impaired
f. breaking a rule - negligence areas
g. interpretation of signals

A: a. vessel to vessel or within a vessel
b. evel of skill in navigation
c. making use of the full bridge team
d. ?
e. current
f. traffic separation scheme
g. nav lights on a vessel

A: a. misunderstand order/command
b. individual thought he knew something, but actually lacked expertise
c. trying to cut corners on maintenance (knew there was a problem, but took no action)
d. stress
e. handicap - drug or alcohol
f. misinterpret rules/regs or ignorance
g. failure to act on an alarm

A: a. lack of communication
b. lack of knowledge
c. lack of management of resources (e.g., bridge personnel)
d. drunkenness
e.
f. misinterpreting/ignoring
g. misreading

A: a. relaying of information
b. ability to act on information or know about item
c. ?
d. mentally impaired due to mind wandering, daydreaming
e. physical impairment - injury, intoxicated, ill
f. requirement to put man aloft in stormy conditions
g. ?

A: a. vital information passed/not passed
b. knowing how equipment worked
c. resources called into play to make something happen
d. ?
e. mostly limitations lifting heavy objects
f. interpretation lead to incident
g. interpretation of incoming information

A: a. VHF regs not followed
b. not proficient in use of size vessel, too much ship for operator
c. ?
d. not used to NY harbor traffic, stressed out
e. alcohol/drugs
f. unaware of Colregs/inland rules
g. ?

A: a. between individuals - master instructs mate, ship to ship
b. level of experience
c. company policy, training, maintenance of vessel
d. alcohol/drug, fatigue, attitude
e. alcohol/drug, fatigue, attitude
f. company pressures individuals to perform job according to rules, regs, etc.
g. failures to use or maintain

A: a. Foreign Language
b. Lack of experience
c. No qualified member on bridge
d. - catch-all - tripped and fell for no reason - not paying attention
e. medical problem, Drug/Alcohol, sea sick
f. Disobeying nav rules/company policies (i.e., wear hard hat)
g. ?

Question 4.18: Give example for each HF Class:

a. Communication _____
b. Knowledge/Proficiency _____
c. Management _____
d. Mental Influence _____
e. Physical Influence _____
f. Rules, Regs, Policy _____
g. Stat Signals/Indicators _____

(Answers presented for each class.)

a. Communication

a. ability to communicate efficiently with crew and other vessels
a. audio, verbal, visual
a. between individuals - master instructs mate, ship to ship
a. comm between ship to ship, talk to anyone
a. difficulty in getting word to somebody
a. fails to make passing agreement
a. failure to establish meeting agreement
a. Foreign Language
a. if didn't have comm, e.g., how they're going to pass
a. lack of communication
a. lack of or incomprehensible
a. misunderstand order/command
a. never used it
a. not familiar
a. radio comms - misunderstanding of verbal order
a. radio doesn't work
a. radio lack of knowledge - improper use - no sound signals
a. radio quit working -captain told mate something and mate misunderstood
a. rarely used missed communication or misunderstanding
a. relaying of information
a. vessel to vessel or within a vessel
a. VHF regs not followed
a. vital information passed/not passed
a. when not talking on radio to each other

b. Knowledge/Proficiency

b. ability to act on information or know about item
b. ability to make correct decisions
b. average grounding
b. didn't know what he was supposed to do - couldn't deploy life raft
b. evel of skill in navigation
b. have used it - when skipper does something wrong - should know better
b. how long been on job - how much they know
b. how much he knows, how well he can do it
b. individual thought he knew something, but actually lacked expertise
b. knowing how equipment worked
b. Lack of experience
b. lack of knowledge
b. level of experience

b. no idea - use when guy does something wrong with a task
b. not familiar
b. not proficient in use of size vessel, too much ship for operator
b. only had license for short period - didn't have good knowledge of towing
b. person didn't know - training/experience - did his best
b. person doing something related to incident
b. pilots erring based on shoaling
b. self-explanatory
b. shrimp boat passing OSV gets sucked in
b. somebody doesn't have enough skill
b. unlicensed person - inexperienced person with con

c. Management

c. ?
c. ?
c. boss says to do something they shouldn't have done
c. cargo management
c. company not providing proper equipment
c. company policy, training, maintenance of vessel
c. company sends 800 HP tow thru Wax Lake Cut for 3rd time this month - office types
c. control of the situation - person making decisions tells someone else to do wrong thing
c. don't know
c. guideline that you will get underway on time no matter what
c. how to prioritize threats
c. how well they manage a situation - e.g., taking on barges
c. lack of management of resources (e.g., bridge personnel)
c. making use of the full bridge team
c. never used - don't know what it is
c. No qualified member on bridge
c. not familiar
c. problems on behalf of company - management's fault
c. resources called into play to make something happen
c. seaman messed up and mate didn't tell him what to do
c. ship's officers, persons in charge
c. similar to supervision mistakes - tells employee to go to winch instead of to raft
c. trying to cut corners on maintenance (knew there was a problem, but took no action)
c. what is that?

d. Mental Influence

d. ?
d. ?
d. alcohol/drug, fatigue, attitude
d. any mental problems hindering
d. catch-all - tripped and fell for no reason - not paying attention
d. complacency - over or underestimating - gets to Sit Assess
d. distracted
d. drugs/alcohol - cut hand on Tony seasoning
d. drunkenness
d. fatigue, drug/alcohol, stress that leads to distraction
d. goes back to management? - don't really know
d. how much sleep, sharpness, quick, cold medicine, how fast they're thinking
d. intimidation - drugs/alcohol - mental, emotional problems

d. intoxicants?
d. mentally impaired due to mind wandering, daydreaming
d. mind wasn't in on it - upset
d. nervous, sleepy, disoriented, seasick
d. never used
d. never used - don't know what it is
d. never used it - subclasses explain it
d. not familiar
d. not used to NY harbor traffic, stressed out
d. stress
d. stress, also company stress

e. Physical Influence

e. alcohol/drug, fatigue, attitude
e. alcohol/drugs
e. any physical problems - handicap
e. current
e. disabilities
e. drugs/alcohol, age, weight
e. fatigue, drugs, how located, vision
e. guy puked all over the radarscope - drugs
e. handicap - drug or alcohol
e. health - vision - hearing - language barriers
e. hours on watch - drugs/alcohol - injuries - disability
e. injured, seasickness, didn't have strength
e. intoxicated, impaired
e. lifting heavy objects and then body gave out
e. medical problem, Drug/Alcohol, sea sick
e. mostly limitations lifting heavy objects
e. never used
e. never used - don't know what it is
e. never used it - subclasses explain it
e. not familiar
e. physical impairment - injury, intoxicated, ill
e. sick
e. went to sleep - hit boat

f. Rules, Regs, Policy

f. breaking a rule - negligence areas
f. CG rules - industry rules - local laws - mfr instruction - not followed
f. company and CG - company policy causes imprudence
f. company pressures individuals to perform job according to rules, regs, etc.
f. did something wrong - erroneous Standard Operating Procedure
f. didn't follow rules of the road
f. didn't understand them, company policy conflicts with regs
f. Disobeying nav rules/company policies (i.e., wear hard hat)
f. doesn't check into VTS as he leaves dock
f. failed to follow - e.g., master doesn't follow procedure
f. how well they know them, if at all
f. ignorance of, casual disregard of
f. interpretation lead to incident
f. misinterpret rules/regs or ignorance

f. misinterpreting/ignoring
f. never used it - violated rule of road
f. not familiar
f. requirement to put man aloft in stormy conditions
f. rules of the road violation
f. rules of the road violations
f. tankerman failed to comply with transfer procedures
f. traffic separation scheme
f. unaware of Colregs/inland rules
f. violated or adhered to

g. Stat Signals/Indicators

g. ?
g. ?
g. ?
g. don't know - aids to navigate
g. don't know - or use
g. don't know stat - didn't turn signal lights on
g. don't know what Stat Signals means - bulb burns out, where located, flashing red
g. don't really know statutory - layout of operating station
g. engineering casualties - watchstanders fail to hear an alarm
g. failure to act on an alarm
g. failures to use or maintain
g. hit a platform in a fog - indicator was not followed - not used a lot
g. if remember correctly, warning sounds signals
g. interpretation of incoming information
g. interpretation of signals
g. malfunction in idiot light
g. misreading
g. nav lights on a vessel
g. never used - don't know what Stat stands for
g. never used it - don't know
g. not familiar
g. not sure statistics? status? wouldn't use it if I can make it fit into another class
g. traffic lights on river, engine room equipment displays
g. use any signals (e.g., whistles)
g. warning signs - obstruction light - warning beeper on radio - bridge alarms

Appendix I

Interview Answers to MINMOD Computer Questions

--When do you use the computer?

--MINMOD training

--MINMOD documentation

--How does MINMOD make your job easier?

--How does MINMOD make your job harder?

--List problems with MINMOD

--Do you use the Help screens?

--Do you make changes?

--How do you decide which code to use?

--How do you get around problems with MINMOD?

--Where do you go for help with MINMOD?

Question 4.2: When do you use the computer during an investigation of a casualty? (any use, but specifically MSIS and MINMOD) During a case, how many times do you work on the computer?

A: all towards the end - when everything is done - maybe 4 different times

A: stages: initial information, open case - go back when almost complete (work on computer 3-4 times)

A: early on to open up case (then it will get taken care of) - put in as much as possible when it's opened (then don't have to have scraps of paper) - a lot of composition of words at the computer - 3 or 4 times/case - opening/doing/closing - some things have no need to retouch until after hearing

A: input data received, use additional product set that doesn't fit otherwise (narrative supplement) - use data within MSIS, using computer as tool - checklists, forms are useful - used printout of forms

A: after investigation is done - 2 sittings: open case from 2692, then complete input

A: after I've collected all the information, once I'm ready to close the case - average of 3 times per case

A: once for simple - maybe fifty times for complicated

A: at the end, once - except maybe will go in after hearing held and then sit on it for 30 days - hard to use it as IO school taught

A: may pull up vessel history file, IP file, before going out - then enter final - 3 or 4 separate times - open a supplement, find need more, go get it

A: yeomen generate IAPR - varies with IO - minimum of 3

A: 5 or 6 times

A: all along - 3 or 4 times during a case

A: after interviewing involved - hasn't speed

A: a little in beginning, vessel history, MerManPer, mailboxes to other ports - a lot at end, enter all product sets - better to do all at once, wouldn't want to enter as I go - compose text on case, occasionally come to conclusions using F6 to see codes

A: ASIO-SIO-secretary - I don't get on computer until its entered - average case, get on 5 times, if had my own computer would only keep notes on computer and not on paper - waste of time to repeat paperwork - purge file of all information, should only be on computer

A: sometimes in for other data that MSIS can provide

A: will work on a case in the computer - may get on six times during - try to have something happening on cases

A: do IAPR - afterward, when everything is complete, do final - 3 or 4 times

A: do investigation first then put on computer with IAPR - then analyze, then organize, then switch to MCIR - initial, finish off, validate, 3 or 4 or 5, 2 for changes and validation

A: initially for IAPR - then toward the end after all the facts are together - 3 times

A: here the computer is the king - 2 or 3 times - log time

A: IAPR, to open the case so that SIO can see how many cases each IO has - then not until the case is completed, write up all supplements, etc.

A: IAPR entered from 2692 - gather information, enter it all at once - paper files, like to keep information on paper - case that's complex (hearing) do in chunks (pre-trial, post-trial)

A: MV - access database VFEI, PNEI, VDEI for background information - then wait until end to write it up - want log to summarize work as case progresses (e.g., phone calls, gist of call, time spent) - need tie-in with LEIS and National Criminal Information database - want data on rap sheets, criminal and motor vehicle violations

A: open case - when starts to get too much data to keep organized - will start entering - scratch notes in interview, then at office rewrite notes to catch logic and details - then finish up when ready to close the case - find out some data are missing (like name or address) - go back to computer with missing information

A: administrative staff opens case, then at end of case IO enters rest of data (keep notes in paper file) - I'd like them to use PA case as notebook/log - would like to be able to use MC that way too, but can't, because if get out of IAPR and forget a facility or vessel, have to start over

A: "feed the beast because we have to - don't get anything back" - tickler files, database searches could make it more useful

A: secretary opens cases, then IO accumulating data, I update computer files as get information - have had simple case so far - maybe use MSIS 3-4 times per case

A: usually (1) to open (2) then not until end - use VPEI to get vessel and operator information

A: case gets opened, either by IO or administrative staff - MVCA and PACA allows logging of what you do during investigation, not in MC - not interested in keeping notes/logs on computer

Question 4.6: What training do you have (specifically) on the MINMOD? Do you feel you are adequately trained?

A: none - OJT

A: none

A: no formal training - took document designer course at District - MSIS hotline, used once, how to transfer text to MSIS

A: in IO school

A: IO course

A: no formal training

A: IO course - OJT here

A: no formal - just in office, training and hands-on - ASIO's lessons learned

A: just IO school

A: none

A: one and a half days from Jim Law

A: Jim Law, Doug Rabe, and a WO, Spring 92, gave basic stuff - one IO go to MSIS school

A: OJT plus minimum at school

A: when Jim Law came - Bob Camebicci walked through couple cases - otherwise OJT

A: only at IO course

A: OJT - enter as MC product set - reviewed work

A: IO school - PO Seal from MSIS school in Morgan City

A: just Sheek and Jensen road show - OJT

A: 5 day MSIS for IO - OJT

A: no formal training, OJT - take a certain kind of case and learn it - MC, PA, learn by repetition

A: IO school, 1.5 days in NO with Jim Law - OJT - MSIS, 5 day course

A: IO school - OJT - some in local formal training

A: OJT

A: IO course

A: IO school

A: none; no

A: Yorktown IO school

A: MINMOD course, Jan 92 - Jim Law and Pete Jensen, 10/92

A: course at Yorktown,

A: no formal training

A: IO course

A: 1 day at IDC on general MSIS

Question 4.9: What documentation (or other aids or information) do you have? Do you use the documentation? Why or why not? Is it adequate for your needs? Suggestions for improvement.

A: MC guide - dated April PACA Guide - haven't used much
No; rarely use, too voluminous
No; not user friendly, difficult to read - difficult to glean instructional material out of it

A: have an example final report with 2-3 letter codes - have page for Human Factors; customized
- MSIS book is too much information
- manual isn't laid out like case is laid out - 6 forms - some have items that just map over - injured person's name and address, phone - vessel and VIN - 2 short narratives and 1 long narrative- some forms' map over and some don't

A: have product set documentation
Yes
Yes; OK now, difficult learning - hodgepodge - turn sideways - Human Factors definitions are skimpy, definition for MCDD are in MCHF product set information - can't go from screen to screen easily

A: course material from Yorktown - passed on from others
Yes
No; major discovery that you put a ? in space to get help, then have to backspace to get rid of the question mark - send and return speed is such that you can't just input without writing on paper - just tedious

A: coded fields guide - MSIS, transaction guides are woefully out of date - not everything is there that shows you the shortcut - not every way of doing things is published - not given adequate information of how to use the computer
need up-to-date transaction guides - Inspection Dept. Course, MSIS work was in depth - something as in depth for MINMOD would be nice

A: Guide to Coded Fields, IOs wrote flowcharts to assist - called HQ with questions, Jim Law, got satisfactory answer, brainstorm with Jim Law
Yes
Yes; could be better organized - have figured out tricks - MCDD matches to MCDR - trial and error - PA, coded fields that allow you/prevent you from doing things

A: coded fields for MC guide - April 93
Yes; all the time - as a reference
No; Marginal. explains but not very well - should explain every block, not just some - it skips around - needs to be more like Apple (computer) guides

A: put stuff together for myself - charge library

A: MC guide - lots of stuff in a file
Yes
No; guide to coded fields is coded - but it is a timesaver

A: MC Guide - copy of all the supplements that shows which subsystems go with which systems
Yes
No; "something that shows natural flow and progression of each of the supplements" - once you pick from 2nd column, limits choices in 3rd column

A: draft user's manual from HQ - ASIO puts out stuff on e-mail
Yes
Yes; better organized

A: latest MC guide 14 April 93 - PA guide 16 April 93 - MV guide 14 April 93 - PACA guide
Yes; mainly MC guide - will probably be using PACA guide
No; but getting better

A: basic user's guide - freeforming, keyboard, etc, - BUM - transaction guides are outdated - closed the lid
suggestion for improvement - open guidance to MCDD - want short paragraph on what is meant by phrase - explanation of coded field - don't want separate manual/chapter to break out codes

A: own reference book
Yes; frequently
Yes; like more information - big picture - never get any feedback from HQ, what do they want, what do they need?

A: No; type of case, what supplements need to be opened - flowchart of steps/decision tree

A: user's guide of each product set - MINMOD guide dated 16 April 93
Yes
Yes; not excellent

A: have own MV book - MC (not dated) w information notices
Yes
Yes; need definitions for all words

A: release notices from MMI - field information blurbs - local cookbooks - Guide to Coded Guidelines
Yes
No; lot of code abbreviations that we don't understand

A: Jim Law e-mailed update of MC dated Jan 93 - hardcopy of codes
Yes
No; hasn't told us everything - definition of codes

A: MC Guide - have it on computer - in SIO library - think it was e-mailed from HQ - I have my own cheat sheet
Yes; reference
Yes

A: printout of codes I got from Jim Law - MC Guide, Aug - have some version in computer and do search - I prefer to look up in book
printout of codes
Yes; it's working

A: our own field notes - facs of product sets and list of codes - no descriptions
Yes; to fill out the product sets
No

A: MC Guide
Yes
Yes; MC guide pretty good for basic codes - interrelationships not so hot - goal of supplement is covered

A: Personnel Investigations handout - 14 April copy of MC Guide
Yes; not familiar enough to wing it
No; not complete - needs samples/examples

A: poor - Jim Law's MC draft - also a PA document
No; too much pain to sort through - need quick answer guides
No; too much pain to sort through - need quick answer guides

A: MC Guide, April 93 - use explain a lot
Yes; not much - because not helpful, not clear
No; because not helpful, not clear

A: MC Product Set (Jim's Apr 14) - separate one for PA - 3-ring MSIS notebooks (not sure if it has MINMOD)
Yes; can't remember codes, what's supposed to go in the fields
Yes; only used a couple of times, only got it a couple of months ago - explains fields - want to know required fields

A: Product Set Guides, MC, MV, PA, April 93
Yes; codes - class, subclass, system, subsystem - which go with which - can't get that from F6 would like screen of blank form which highlights required and optional fields

A: MSIS release notes, MC (April 93), MV, PA product set notes
Yes; I make them - need to know what each product set is about
Yes; marginally - need definitions for keywords - expanded list of keywords to cover more situations

A: MC, PA, MV Guides - but don't use them - keep own notes
No; no index, no table of contents, can't find things - so must ask others (take their time)
Yes; information is OK - just can't find stuff yet

A: MC Guide, April 93 - PA, April 93, MV, April 93
Yes; for definitions of codes - to learn new product set
No; towing supplement, not easy to read, examples don't cover all scenarios - find it necessary to re-read sections a lot and still might not apply to situation - use short and concise sentences

A: MC, PA, MV Guides - keyword list - local waterbody codes
Yes; saves time (F6 is slow or not useful)
Yes; missing sections - MCDD, missing operations section - screen image incorrect - organization screwed up - MCDD is up front, but MCDD supplements (equipment factor, human factors, etc.) further back, put together - equipment (EF) factors not listed - MV should be broken down into sections - jumps around a lot - information on hearing officer, etc. not needed for IO - MVCF, hard to add another charge or specification - not clear - section misplaced - under 4100, should be updating case

Question 4.10: How does the use of the MINMOD make your job easier? What do you like about it? How does it help you in your job?

A: like going into file and be able to find info (e.g., company telephone #) - prompt you to do thorough investigation - charge sheet, keyword, gives cites and related, really like it

A: no

A: vessel history and IP files are nice

A: narratives can be shorter but CO likes narrative anyway - supplements can prompt

A: eliminates letter of transmittal, buried in narrative supplement -like to see "apparent cause of casualty" was - come to logical conclusion - system works pretty well - problem reports , sometimes work

A: doesn't make it easier in any way

A: I like working with computer

A: it doesn't

A: MCDD, has place that tells you if you've done all your subsets, it tells you what you forget

A: not at the time you're using it - makes easier spinoff cases and looking at vessel histories

A: if it was user-friendly it would make the job easier - electronic system is good - MCDD, writing out apparent causes and chain of events

A: makes every case the same without being the same - system organizes the way you do the case - when I go out I think MCDD

A: keeps everything organized - don't have to go digging thru files - use IASP to track cases - maybe 30 or 40 minutes - use products for inspection, vessel products are very handy

A: "tough question" - as we learn more about it, will be easier - trends in Marine Safety, we could ask G-MIM to pull up historical data - if MIM can give 1-2 day turnaround, that would be fine

A: prints out charge sheets - maps over information - prints FOIA requests

A: MV - access database VFEI, PNEI, VDEI for background information - better than CASMAIN - fewer MINMOD bugs now than in Jan 92

A: puts all the data in one place - forces organization - also can lose a 2692, but won't lose a computer file - checks on data you've missed (and need to go back for) - good historical file

A: forces a structured approach to casualty investigation - sequence of events - don't have to be a good writer with MINMOD - slap in codes - allows unit to search database for similar casualties

A: forces us to do a complete investigation - once you get entrenched in it, it makes sense (but not to the casual user)

A: "nothing" - does reduce paperwork

A: like getting vessel information - can locate people and companies - like that it checks for complete cases before allowing you to forward to SIO - would like access to licensing information (REC files) - often get no data from overseas casualty 2692 on individuals

A: gives format of how to complete case

Question 4.11: How does the use of the MINMOD make your job harder? What do you dislike about it? How does it hinder you in your job?

A: coded values that may not have any value

A: MC cases, rather write narrative than make choice from limited choices, not accurate information - MCDD is confusing, coding is not natural - don't want to string it together - no problem with PA product set PACA needs more options, no option for trying to serve letter of warning and not finding him, if letter of warning was accepted, it shouldn't put in that it's closed

A: makes job difficult - can't express yourself - have to lie to system to get out so you can close the case

A: not user friendly - takes longer - prompts are difficult to remember - can't access information

A: not user friendly - product sets don't fit casualty and then have to manipulate product sets to get the results

A: extra step of sitting in front of computer which may not be available - whole unit is short

A: no hindrance - beats handwriting a report

A: trying to fulfill data entry requirements

A: just time consuming, time used to enter data rather than on boats

A: slowness - computer is boss - locking you out - beeping at you unfriendly

A: user-unfriendly - slow - would like Graphical User Interface - Port Ops should have a different place to work other than MC - like word search - like to track cases with MINMOD

A: hard because how to use definition of code - they aren't defined - no spellchecker on MCIR or MCNS or anywhere, also dictionary for investigation - should be able to mark and bound

A: takes time to do MCDD, MCHF, MCDR

A: not trained sufficiently - so frustrating - selection of codes, doesn't cover everything

A: too many fields - some I don't even know what they are for - everytime a mistake is made it reprints the entire screen, time consuming - data errors appear and need to be fixed, but no idea of what is supposed to fill the field

A: PA charge sheet, hindrance - MV, should have fuzzy logic, now use keyword if not 100% exact, get nothing - need to consider "close" keywords - MV, sometimes cites law that's since been superseded - extremely rigid on format - would like to scan keyword list - "explain" is often useless

A: TAKES A LONG TIME - don't like all the codes - hard to remember - always looking them up (but understands the purpose of codes) - on the other hand, trying to look at old cases for historical data, lots of time only the minimum information was entered - logon and finding cases, seems to take 5-10 minutes - automatically logs out

A: requires extensive administrative time to complete MINMOD - for simple cases, increases time by 400-500% (requires 2 hours instead of 15-20 minutes) therefore requires more IOs - learning curve is SLOW for MINMOD (as separate from learning investigations) coding inconsistencies - need better mapping of information - some codes incomprehensible (cont strategy) - no code for "stupid" or "inattention" - don't know which screens need to be filled out

A: enormous amount of time to input data - RESPONSE TIME

A: archaic - user-hostile - asks for data that is unnecessary to the case - not geared toward field office

A: slow - stats - don't like doing most supplements - feel they are for stats only - doesn't help with case - want spellcheck for NS - incident brief, not enough space, need 2 more lines - MCDR asks for ID#, don't know what it wants - "legal actions possible", what does it mean? - In MCDD subclass, if get help, get ALL subclasses, whether they fit the class or not, should be context sensitive help - too much MINMOD is STATISTICS, which appears to have no bearing on cause of casualty

A: very regimented - may have partial data - can't put it in until you have ALL the data - want to save partial data - PACA, if don't want to use it, need to Abort to get out of it - format's different between PA, MV, and MC - IAPR should allow you to get to any of the three

Question 4.12: List the problems you have with MINMOD (both interface and organization). Suggestions for improvement. What would you like to see in MINMOD?

A: each screen - especially MC and MV - are too cluttered - lack of definitions - too many codes - not user friendly - too complicated - takes a long time to get familiar with system - demands too much detailed information

A: improve by : do away with codes - free form entry -HQ should find out what they really need

A: in operation: no fishing or underway - personal injury: pretty good list (altercation...unsafe movement) - don't see anything - some coding has big holes - left out S. China Sea, left out major bays - instructions for 2692 (what data they're looking for e.g., lat/long) - basically computer system of CG was good - don't have enough computer, uses have multiplied but not # of computers - missing things in codes - most personal injuries are fishing - fishing vessel or fishing processors are considered - seems to have focussed on big commercial ships and tugboats - but now, smaller commercial fishing - Have to everything in relation to DC; should be used like Document Designer, have local node where you're sharing local program, if they could pull out help into local node, then it would go faster. Then would only send complete form to DC. More like Forms Plus. Cut down phone and transmission time -wasting time waiting - "vessel is underway" isn't available

A: nice if required field were highlighted (can only tell if required if data entry) - reportable casualties (casualty summary type) (with MCDD type of event) - problem with firefighting equipment (enter as fire but then say no fire) - problem with lifesaving equipment (enter abandonment) - narrative supplement, press go, then have to press go again or more, have to press extra keys instead of smoothly going from one screen to another - Human Factors keywords, give grouping of related areas (all the way across) - would be nice if unit level could pull out information that.... - always fill in - at unit, never use Human Factors data, only use for statistics, who would ever use the third column (cmdr pull up causal information?) - HF codes too comprehensive

A: put dollar price on downtime spent on waiting for screens (TQM puts medium for rocking the boat) - system downtime occasionally problem (backup computer at Thurs 4 pm , east coast doesn't take into account far flung time zones) - use of abort, do I dare to use it - if hours aren't up to date, you can abort - hit hyphen in command line and it comes back - either vessel on IAPR, doesn't get carried over to MCIR - same words don't have same abbreviations throughout (2 letters or 3 letters) - MCDD, equipment failure, goes to supplement and reflects back - on MCEI goes down to where you start typing, on another toggles down to Port and have to space down to where you actually start typing - time to recover, refresh time should be faster

A: sometimes put in data, get fix and resend, and have no way to know what's wrong - go find help, find someone who's done it before; "this information needs to be done before"5-10% of time

A: On MCDD, use EQ for equipment failure, on IAPR, use EQP; not consistent - don't change codes - use same codes that are used in other product sets; Problem report: violation report, don't have correct law cites

A: too many restricted (required) fields - sometimes it helps, but have to put it in - put in wrong informtion and make note someplace else - put in something close - put in problem report to change something - can't change case after "X"; remove restrictions - provide guidance for what's required and what's not - give computer power to change things that are wrong

A: once you get started, you can't stop - no guidance available - if I could just look in a book - don't like format - once you make an entry, often have to hit Send more than once - computer should ask a million questions and then put it all together - mouse - graphical user interface - a hotline for MINMOD

A: some codes are extremely specific and others are very vague e.g., hand, back , not specific enough - MCPC need IPN, have to abort and reenter - the amount of information you can bring in, can only take in chunks at a time - once MCDD is closed, can't change MCCR and MCNS - codes in MINMOD don't reflect what's on the the 2692, don't have heavy weather damage, ice damage, damage to aids to navigation; allision can't be meeting, crossing, or overtaking, vessel abandonment not on 2692 - there aren't enough valve types, just says valves - what are the acronyms - can use lots of the subclasses and descriptions, they overlap and they aren't defined and clarified - wind, increasing, decreasing, no steady - no search backup, when you're done search you don't go back just one page - can't use wildcards with names - search not really organized

A: problems with narrative supplement window over from Document Designer- if sent to ASIO, can't change supplement without HQ unlocking, sometimes takes 3 weeks - MCCG, asks types of damage and penetrations dimensions, really more of an inspector supplement, only way he can fill it out is look at MI case and see what inspector put down

A: designed by people not in field and have to use the system - how does question about maritime academy help?, very few people have - simple narrative could replace 5 or 6 supplements

A: remembering codes and code combinations - MCDD - PACA - need 2 subjects for collision and allision, won't take two - sometimes won't take even if all supplements do

A: use codes, don't know what HQ intended by modifiers (e.g., use wave when they really mean wake) - not a user friendly system, used in field never develop expertise - sometimes product sets don't fit casualty, not enough flexibility (e.g., lifesaving equipment) - designed system background - appears system was designed to put out informtion, not for input from field, difficult to put in - wish they had glossary of terms - don't know which modifiers will match what classes - PA product sets, wish we could go through and search by name and SSN, if SSN was available ask for port of issuance of MMD, but can't get there, assign IPN, but no listing of IPNs, can't look at prior history -HQ can only search by fields, have to go to HQ (e.g., search by name of ship) - outside information, also internal management tool, can't sort and search (e.g., in pollution investigation we're interested in who was polluting) no kind of report from HQ regularly - lack of computer terminals, case build up close to week, need terminal for word processing

A: MC product set - MV/PA - be able to go through own port log and search by criteria

A: guy accepted charges, since there's a change of venue, now SIO has decided to issue LOW and MINMOD won't accept it , no way to take out - lack of flexibility in PA cases, date automatically defaults to today's date, if you don't overtype, then you can't change it again - flexibility at user end - ability to change things - things need to be filled out highlighted - uniform definition of fields

A: need training - IOs and reservists could do input - easier to get a measure of what they're doing - too busy to read - Jim Law came in March, too much MSIS at once, 2 days, video tape with lessons on it in blocks (for IOs/reservists) - product supplement, purpose - format of everything being capitalized is terrible - even looking at template to only show what the fields are filled in - format too busy - using bolding, backshading - could use piece of paper to fill in - help with one line time

A: MI set is much better for users, easier to enter and schedule case - very hard to enter MV - if you confuse PA and personnel casualty, why go thru IAPR and then put block with 2 similar names, confusing - in inspections, easy to keep track of where I'm going - A lot of required information, at end there is required field, must have IPN, but can't get IPN from another screen, but can't get out to get IPN without aborting all the other work - put required product sets at beginning - log on other computer to get IPN - should make required fields as easy as possible - why does MC need IAPR? not named MCPR? how am I supposed to know that need to do IAPR, everything should begin with IAPR, guess that IAPR lets you only put what you know, name gets me confused, confusing for a new person - PA cases, MC cases, why aren't formats exactly the same for PA/MC stuff? - place where boss reviews/endorses, other place the boss doesn't get a place to review - failsafe procedure so no case can be closed without endorsement by boss, should always be able to re-enter case until boss says it's closed - codes aren't consistent in required fields, for exact same word, codes are different, 2 letter, 3 letter, 4 letter codes - all codes should be done the same way, can't learn them, have to look them up - shouldn't be anything that is stuck until the boss endorses and closes the case - requires latitude and longitude, but don't often know the lat and long, shouldn't put in lat and long unless you're at sea - reservists are afraid of computer, only use it once/month - IAPR, enter water body, but doesn't have Colorado River (use NWXXX)

A: more time you spend, more comfortable - forcing yourself to know - more choices and defining choices - equipment failure has extensive list - words don't hit nail on head for certain cases (e.g., Vessel cut towing hawser, had to capture it as collision, but two vessels didn't collide - more explanations of event, more ability to define incident

A: no adequate provision for unsafe movement - codes need descriptions - lot of codes that overlap or even synonymous - allow you to fix MCIR without doing all supplements - rather than print out the supplements and go back to IAPR and then redo everything - mouse and windows

A: complicated - MCDR, MCCG, MCFL, MCSD, all complicated ask for information not on 2692 - maybe update 2692

A: a way to get back to IAPR without deleting supplements - MCIR, environmental mode needs explaining - MCDD, status, don't have fixed definition of structural failure (MCSF), is normal use failure - need don't apply box, damage due to allision, fore, etc - Towing Supplement, a little bit confusing on location A1, A2, A3 - C+G, wording confusing, distance from forward perpendicular to center of damage - protected areas, what kinds of protected areas are you talking about, need stern and bow, not port or starboard - deficiency report, got system-subsystem mismatch, should be able to freeform on - PC supplement, injured person's experience sometimes only days, could have another block for days or other - MCPC codes OK - FCS supplement, time to sink, may flood but not sink - need more instruction on how to use each supplement - especially in MV cases

A: no more

A: can't retrieve information from MINMOD no standard search routines for the database - not all units hooked together (e.g., can't get license file from RECS) - locks due to security - probably easier way to display information for readability - codes are limiting to try and tell a story - get cases there are no codes for (e.g., no oxygen explosion caused by cutting torch diving; blowout on an oilwell; collision, no main deck bulwarks damage)

A: not informed yet - gut feeling, lots more entry than in inspections - nice to have MV listing

A: ice buoys, put down as equipment failure radar, but really buoy needs reflector, don't know how to code -required items should be highlighted, indicate supplements needed - sometimes HELP tells field size, but not content - organization file, you can select product sets in the order you want to do them - checklists like inspection, prints out all information/specifications on vessel, pre-inspection checklist - better help

A: too many fields - when system won't take a field can be difficult and time consuming and frustrating to fix - too many options - field information sometimes too general, sometimes too specific - hitting submerged object, nothing in MINMOD for this - long and lat, don't always have it, seems like overkill, why do we have to calculate long and lat - violation case, smooth - casualty, go back and forth a lot - IAPR, verify is last thing to do, but at top of screen, not bottom - would like to do some supplements before MCDD, can't put in a part of a supplement, must complete before you can save for the time being - IAPR, verified and tried to close to file, wouldn't take it, had to go to MCIR and then close to file, doesn't make sense - Windows - USER GUIDE -at 8th grade level, lots of folks aren't computer savvy - waterbody codes aren't logical - also mark required vs. optional fields - allision doesn't fit MCDD (crossing, meeting, overtaking) - MCDD hard, some fields I have no idea what to put in them

A: want a USEFUL help facility - should be able to open case and be able to feed to MC, PA, and MV concurrently, because often happens that way - tickler file could be useful - should be able to find a given charge and spec instead of going in order screen by screen

A: SLOW - crashes a lot - auto logout without auto save first, get a phone call, lose case - codes - required fields - can't put in ranges (e.g., visibility in fog may range from 50-100 yards, depending where you are in foggy area -everything should offer a comment section (if codes don't reflect the cause)

A: PA, SS# can't be put in without going back to IAPR - codes mapping - inconsistent data entry in different product sets - PA, close out in PACA, if forgot resources, go back to PAIR to do resources and go back to PACA to close - in MC, close out in MCIR, in MV resources are in MVCA instead of MVCR - MCDD does its own checking for codes, maps to most other parts, except MCDR, which maps back to MCDD - MCNS gets locked when IO forwards to SIO, dumb, IO can't change it now (have to send mail to HQ to unlock it) - MCPC, MCHF, MCPA, forget to get IPN for person, need to abort and go to PNM (Part Name) to get IPN, should be able to initiate IPN search from the other modules - want to save incomplete screens rather than have to abort and start over - want to transfer cases in MCIR from port to port (have to go to HQ first, want to eliminate the middle man), can send IAPR, but lose most of MCIR data - if want to delete a case, must delete supplements first, why can't computer do that

A: regularly goes down, lose your work - can't rush the machine (typing before field there) or goes down = freeform, long string (e.g., MSIS,U, CASE = xxxxxxx), easy to make typing error, wipes out command line, can't just edit it - time-consuming - redesign SW to work better - if 2692 asked some of the questions needed, better linkage between 2692 and MC (e.g., SS# or MMD#) - make IAPR products more closely resemble the 2692 (verbatim) - use mouse to check boxes/menus, not type codes - click Human Factors and supplement would window open, get lists of new scenes that become required in response to entries (e.g., it's a grounding, therefore need MCCG, etc.) - want dictionary, etc.

A: put in data and press "go", get error, hit F7, sends to a block, if you notice an error prior to that block, can't tab back, stuck with codes - faster is to provide description, codes force you to be vague instead of specific (e.g., broken hydraulic line - deck system - that's 3/4 of the ship!, not specific) - not logical (e.g., why a separate PAIR and an MCIR, should be just one) - can't get REC data, can't get inspection data, can"t access VIN/party information easily - too much duplication - too many different people doing same thing with different systems (inspection, pollution, etc.)

A: IPN# ties an individual or bridge or ship to the case, then can search database to see if they're associated with any other cases - if forget to get the #, have to abort supplements and get #, should put IPN in IAPR, so have to get it before starting supplements, need in MCPI - MCPA asks for SS# and MMD# (which is same as SS#) - if put in SS# and MMD#, won't take it - sometimes have to leave one of them out in order to "take" - organization, have learned it, very frustrating and confusing for new IOs - proper training right from the start would help - don't do MV and PA very often, forget how to get to stuff in it - sign on, put in case information (command), then password, if get password wrong, wipes out command line - more accessible for information (like licensing, background information) - now have to contact HQ by e-mail to get background information - do away with lots of questions in supplements - want a portable computer to take to field - input data right there - could prompt new IOs what to collect - access CFRs, etc. on the road (you get challenged in interviews) - LANT and PAC Strike Teams have portable computers - 2692, add MINMOD info, like height, weight, etc. (MCHF), add MCCG, measurements of damage, more detail on equipment failure (exact parts)

A: MVCF, hard to add another charge or specification - have to open up 2nd MSIS to search for IPN - codes could be more understandable - make menu to show hierarchy of class/subclass/state

Question 4.13: Do you use the help screens (i.e., ?F6) Yes No
If Yes, what is your frequency of use of the help screens?
Seldom Sometimes Often Every time I enter data
Is the information on the help screen useful/adequate? Yes
No
If No, explain. Suggestions for improvement?

A: Yes; often - 60%
useful that it's there, but doesn't really explain or define
No

A: Yes; use every time
some don;t have enough information
Yes

A: Yes; every time I enter data
OK - but takes too long to come up - might not use ?F6 if handbooks more available (usually left back in office)
No

A: Yes; if don't know code
only help screen is "explain", would be helpful to have more information; "DMG slot required", going from IAPR to MCIR is useful
No

A: Yes; for PA, sometimes, not many coded fields - MC, rarely, have book
PACA definitions and results of entering codes (e.g., can't do change of venue when charges haven't been served)
Yes

A: Yes; often
will show coded fields, but they're coded, but you don't know what the abbreviation for - ought to tell you at the top where you are (what screen you are on)
No

A: Yes; often
some are self-explanatory - some are not
No

A: Yes; sometimes
still a code to a code
No

A: Yes; often
useful, but not always adequate - useful when it tells you what to rule out
No

A: No
No

A: Yes; sometimes
often has no required format - there's nothing telling you so - for case action in PACA, I printed it out and gave everyone copies - don't tell you under what circumstances things are allowed - only a reference, not situation specific
No

A: Yes; seldom; have printed out screens and refer to printouts when in doubt
information overload - hundred options - trying to find out system/subsystem is hard (e.g., fuel filter, using fuel strainer in MINMOD)
No

A: Yes
if they are there, there's some information, but too abstract
No

A: Yes; at least once every case
pretty good - once you learn it, sometimes doesn't have any information, but it's free form
Yes

A: Yes; often
if computer is fast, use ?F6 - don't understand, syntax error, but help screens won't give choices so I blank it out and leave it out - hit and miss take time - Z# in PA product set

A: Yes; sometimes
useful not adequate - no descriptions or examples
No

A: Yes; every time I enter data
codes not sufficient - system-subsystem mismatches
No

A: Yes; sometimes
suggest explanatory material on all the help screens - what it is
Yes

A: Yes; every time at first, now use printouts from Jim Law
don't get system-subsystem mismatches as much

A: Yes; sometimes
faster to look at book then call up screen - doesn't really give you a whole lot of information though
Yes

A: Yes; often
not informative - codes for allision - codes make computer happy, but no real bearing - not much flexibility
No

A: Yes; every time I enter data
not context specific
No

A: Yes; often
some fields have no information - an asterisk or similar symbol could be used to denote those that will supply help - put into windows format so doesn't take away the screen you're working on
Yes

A: Yes; every time I enter data
No

A: Yes; seldom - usually use printed code lists, faster
sometimes doesn't explain what it wants ("yes", "no", N, E, W, S)

A: Yes; seldom - can't get help during review of cases (read-only) for minor problems I'll sign out as SIO, log on as IO, fix problem, sign out, log on as SIO and review/approve
yes and no - get information on field, but doesn't show class/subclass organization - just gives all classes - causal factors, get two pages of EF (equipment factors) first, even though you checked WX - need context sensitive help
No

A: Yes; sometimes
yes and no - helpful because I know what my options are, but no, because no definitions
No

A: Yes; every time I enter data
like it! - get list of abbreviations - have to write it down because can't highlight and get it to automatically go in
Yes

A: Yes; every time I enter data
yes and no - has codes - too much information, not context sensitive - too slow
No

A: Yes; sometimes
F6 is slow or not useful - using book more because faster - the help for "number of characters", say "Yes or No" (i.e., don't tell me how many characters go in the field, tell me what type of data is expected (e.g., Yes or No, vs. free format) - let IO know which blocks are free form text - need to supplement "NEC" with explanation - "NEC= no earthly clue"
Yes

Question 4.14: **How often do you make changes to information already input in the MINMOD?**
never sometimes often
What problems do you have in making changes to information already input?
Suggestions for improvement?

A: sometimes 50%
once NS is sent to ASIO, it is locked; MV - try to make changes to charge sheets - add or delete charge; research - MVCL is very cumbersome - can't Boolean search by category (e.g., type of vessel, rules of the road)

A: often
writes notes to himself, request supplement in MCDD by (X), if remember to take out "Y"

A: often
problems with cutting off edge

A: rarely, except in narrative
no problems

A: rarely
PACA, can't touch it after it's in there - MMD# , send in problem report to get it changed - allow more freedom

A: sometimes - 50%
sometimes once computer locks on, it won't let you change unless you go all the way back to IAPR - be able to make changes anytime - final step: that it's ready to go - shouldn't lock on until you're through - why can't you do a MCCG before MCDD when I have the information for MCCG and not MCDD - computer shouldn't direct the way you do an investigation

A: rarely
too difficult because stuff is locked

A: never
can't just go into a supplement and change - may have to open MCDD and other supplements and then have to go back and update resource hours on MCIR

A: don't use

A: sometimes
encourages not to enter until correct - because of groups of allowable items - can't put in every step - can't use PACA as real time record

A: sometimes
uniformity of all knowledge

A: seldom
change other people's work, reservists, old cases, typos - usually not too difficult, product sets might lock up - enter vessel name and ID, type in V for verify, name of vessel wrong spelling is stuck forever - PACA, typo in case action will be stuck forever, can't change your case action

A: never
except narrative supplement - can't change narrative supplement after its forwarded, so printout and review - might be nice for IO to keep data

A: often
stay in IAPR as long as possible - can't change stuff in MCIR (e.g., VIN, have to delete supplements to get back to IAPR)

A: often
because of review - to change MCDD have to erase supplements HF, CG - be able to change IAPR - get locked out of MCNS when send

A: often
can just delete and put new information in - can always go back to IAPR and refill stuff

A: sometimes - 50%
there was at one time - MCDD and MCHF - want to eliminate product altogether - had trouble doing it

A: sometimes
usually only to MCIR - sometimes get locked out - like NS, so use Document Designer

A: often
some lock outs - damage field on MC set,, non-seaworthy after sent to SIO changes can't be made during review - must have HQ unlock fields - allow changes, even after verified new information may come up

A: often
want to change narrative MCNS to be better worded - no problems so far

A: sometimes
add vessel - MINMOD destroys case (so printed out case, then added vessel, the retyped case data, wasted an hour) - make changes in MCDD, sometimes lose a supplement - leave all fields open and accessible until after unit review - if data incorrect/incomplete, highlight so you know what needs to be entered/corrected

A: sometimes
about 1 out of 10 cases during case review, however about 90% of cases get kicked back to IOs - can't do it as SIO (read-only) - MCNS, can't change - MCDD, supplements complete block, what's it for, if you say "Y" can't change anymore, have to go back, take out "Y" - want SEL,20 = login screen, -MCIR,U,IO, would like to freeform directly to login screen

A: sometimes
sometimes for my own entry - often for review - make sure completed supplements are shown in MCDD - problems, for unknown reasons, it won't allow changes, then have to hunt around to find out why - make one place "lock/unlock" block - need prompt to tell you WHY you can't change a field

A: often
F8 key nice (everything forward of cursor deletes)

A: sometimes
IPN, if need to add a facility, must delete everything and go back to IAPR

A: sometimes
wanted to change PA from S&R to Civil Penalty, PAIR had already been filed, needed to take off wanted list first, tried to change both at same time, couldn't, had to do wanted list first, then come back and switch from S&R to Civil Penalty - IAPR, if need to change vessel name or number, lose entire case

Question 4.20/21 How do you decide which code to use? What do you do if you can't find a code you want? Do you have any examples of situations that can't be coded?

A: as well as system can

A: don't know rating for MCHF

A: sometimes information presented is misleading - why does MCHF have to be there? - what is captured here that isn't captured on MCDD

A: never know for sure - more time delving into mind

A: try to take time - could speed up if we had definition of what they meant

A: bound to be accurate, for every situation there's probably 5 codes that will work

A: more codes in MCHF

A: hard to say if something fits into management or knowledge (e.g., member of bridge team should have knowledge of bridge management)

A: doesn't use MCHF

A: MCHF codes almost getting too specific - a lot you don't know

A: "mental influence", sounds bad - MCHF classes are accurate, subclasses are not so accurate (can't always find a subclass to fit your case), states are worst (either don't fit your case, or don't make sense)

A: make 'em work

Question 4.23: How do you get around the problems you encounter with the MINMOD?

A: lot of times give it the bare minimum so can go on to another case - delay

A: IOs, SIO, problem report; MINMOD

A: serious: problem report - non-critical: ignore or make it work

A: Basically, ask as many people who knows about it - try to figure out myself

A: usually use NEC code for one time coding that can't find

A: do minimum amount of supplements - if have the information, will put it in

A: avoid some supplements - if you can't tell it the truth you get as close as you can to where it will - like a jigsaw puzzle with no box to look at

A: will check documentation - just abort and send problem report - usually get good and fairly responsive response, often next day, never more than 3

A: problem reports - call Jim Law, he's been helpful - not worth our time, missing information is not worth time and effort, mention in narrative

A: my boss - helps figure out what to do about

A: ask co-workers - just don't do stuff (e.g., don't enter equipment failure as cause, because then must enter deficiency report

A: try different avenues - try different codes - print out several alternatives

A: leave it out - call Jim Law (best for MC) - send him an e-mail - pretty responsive

A: every time I make a change I do -,U so have latest updates - do as much stuff in Document Designer as I can and then window it in - stay in IAPR as long as possible - log hours in a little box on front, why not an hours box on IAPR

A: trial and error - MCDR very frustrating - go back and change MCDD so it let me out of the system

A: just try to find a solution - talk to other people in department with more experience - talk to system manager - haven't called HQ

A: talk to other IOs - tons of cases in the files to look at if we need to - the SIO

A: if can't get solution at MSO, call Jim Law or MSIS hotline

A: shift abort - go

A: bulldoze through - get as close as you can and then send it off

A: "kick and scream"

A: abort and try again

A: ask for help

A: trial and error - look at old cases to see what was used - use MC Guide (Bible)

Question 4.24: Where (or who) do you go to for help with MINMOD? Specifically, the human factors part?

A: other investigators - never to HQ - answers in past - got shuffled around at HQ - no answers - go to ASIO

A: IOs here

A: transaction guide - other people (co-workers) - call MIM sometimes (problem report), usually get a response

A: Jim Law - IOs

A: another IO in New Orleans

A: MC, other IOs - ASIO, if problem send to HQ

A: MC Guide and user guide in office - then other IOs - then back up and remove stuff until it accepts it

A: IOs or HQ

A: first go to book or IO - second, SIO

A: book - ask other IOs

A: co-worker - manual - call HQ, help has been useful

A: use book, other IOs - for HF to SIO

A: CMDR Sheek when we were there (at HQ) - Mike Gendrosik (good in general) - Chief Morse (good in PA)

A: SIO - Jim Law

A: nobody, I'm it - can call Jim Law - MV, go to SIO - sometimes minor stuff, go to other IO

A: SIO, ASIO, another IO

A: SIO, definitions for human factors part - he's the guru on that

A: if can't get solution at MSO, call Jim Law or MSIS hotline - haven't asked for help on Human Factors part

A: Boss (SIO) - HQ

A: MSIS hotline (Jim Law) for codes - talk to IOs about whether a human factors cause is supportable for a given case

A: problem report to HQ, MIM, usually excellent response - but sometimes HQ responses are frustrating (had to send request to invalidate case, unlock MCNS, had to make requests 3 times to get it)

A: SIO - use manuals a lot - HF, the manual and IO on the case

A: IOs

A: no one for HF currently (used to go to a specific experienced IO, now in Inspections)

A: SIO or ASIO

Appendix J

Human Computer Interface (HCI) Deficiencies Table

Human Computer Interface (HCI) Deficiencies Table

As part of the investigation into how the IOs use the MINMOD computer program, a standard human factors evaluation was made of the human-computer interface (HCI) of the MINMOD program. This was not an exhaustive evaluation, but intended rather to note obvious HCI problems with the system. The evaluation was aimed primarily at the form and structure of the interface, rather than at the content of the MINMOD program. References used in the evaluation include [13-15]. The evaluation revealed a number of HCI deficiencies in the MINMOD program. The deficiencies are set out in Table 1 below, which lists specific guidelines for good HCI followed by examples from MINMOD where those guidelines are broken. The third column in the table indicates whether or not the deficiency was specifically mentioned by one or more of the IOs. The guidelines represent principles for interface design that are known to aid human performance and to assist in reducing human error and frustration. The examples of deficiencies are taken, whenever possible, from IO responses to questions about MINMOD. It should be noted that some of these deficiencies (such as response time problems) are inherent in the USCG standard workstation with which the IOs must work.

As this table shows, the MINMOD program violates a number of basic HCI guidelines, and as the third column shows, many of these violations were sources of IO complaint.

Table 1. Deficiencies Identified in the Human Computer Interface Evaluation of MINMOD.

Guideline	MINMOD Deficiency	User
Similar names for different displays should be avoided	One operator complained about the similarity between personnel action and personnel casualty	Y
Labels should be horizontal (no vertical labels)	MCIR - supplements	N
The units of measurement should be labeled on the screen	wind speed and wave height on MCWX, height on MCHF	N
Labels for data fields should be distinctively formatted or highlighted so that they will not be readily confused with data entries	Throughout the program there are no distinctive differences between labels for fields and the data within fields	N
Where entry fields are distributed across a display, a consistent format should be adopted for relating labels to entry areas	Some data are placed beneath field labels. Some labels are linked to the data by a dotted line and a slash(..../), some by a slash (/), and some by a colon (:).	N
Message dialog should not be hostile to the user	The message "data error, fix and resend" was viewed as hostile by many of the IOs	Y
The message should consider the prior knowledge of the user and the user's context	Messages within MINMOD are not generally context specific	Y
Only standard and commonly accepted abbreviations should be used	Cont is such an unfamiliar abbreviation for control that only a few of the IOs, SIOs, and ASIOs could identify it.	Y
Abbreviations should be consistent in form	The same words have 2, 3, and even 4 letter abbreviations. On MCDD, EQ is used for equipment failure, on IAPR, EQP is used	Y
A dictionary of abbreviations used for data entry, data display, and command entry should be available for on-line user reference	No such dictionary is available within MINMOD	Y
The system should contain features such that a user can request corrected information when an error is detected	MINMOD does not contain this feature	N
Error messages should specifically state what is wrong and what can be done about it	The error message in MINMOD are generic and do not provide specifics, nor are specific remedies provided	Y
The wording of error messages should be appropriate to a user's task and level of knowledge	The error messages are too general for the form-filling task the IOs do	Y
Following simple error messages, the user should be able to request more detailed levels of explanation	MINMOD provides only one level of error message	Y
A listing and explanation of all error messages should be available on-line	Such a listing is not available within MINMOD	N

Following error detection, users should be prompted to reenter only the portion of the entry that is not correct	When a command line is incorrect in MINMOD, the entire line must be retyped	Y
Error messages should always state at least a minimum of (a) what error has been detected and (b) what corrective action to take	MINMOD error messages only do this at a very high level, which is of little use to the user.	Y
The detailed internal format of frequently used data fields should be consistent from one display to another	The length of the incident brief field differs from MC to MV	Y
If data are to be entered from paper forms, the design of the input screen and the layout of the paper form should correspond	MC products and IAPR do not match the 2692	Y
When label sizes vary greatly, labels should be right-justified and the data fields left-justified.	Throughout MINMOD, both long and short labels are left-justified	N
When form filling, users should be allowed to alter input during and after entry	The MCNS was particularly mentioned in this regard as was the need to delete supplements and return to the IAPR to enter SSNs	Y
The system should recognize common misspellings of commands and display inferred correct commands for user confirmation rather than requiring reentry	The MINMOD system does not do this	Y
Text should be displayed in mixed uppercase and lowercase	The MINMOD system uses all uppercase	Y
When frequency of use is not a major concern, information should be functionally grouped	On the MCPC, the information about the injured party is scattered about the form rather than being grouped	N
Screens should provide cohesive groupings of screen elements so that users perceive screens as consisting of smaller identifiable pieces	Most screens in MINMOD do not show obvious groupings of identifiable units. For instance, on the IAPR, the reporter information runs into the incident information, and even the titles for the Reported Information and Incident Brief do not do much do obviously distinguish that information from the rest.	N
Screen packing density should not exceed 50% and preferably should be less than 25%	Most of the MINMOD screens have a packing density closer to 70% than 50%	Y
Screen design and content planning should minimize requirements for user memory	MINMOD data entry requires the user to either memorize or look up the appropriate codes	Y
When a command is not recognized, the computer should initiate a clarification dialogue rather than rejecting the command outright	MINMOD does not do this	Y
In general, update rates should not exceed 3 seconds	Many observed MINMOD update rates exceed 3 seconds, indeed many updates exceeded 30 seconds	Y

Other than loading and restarting, the response time to any single user activity (e.g., request for next page) should not exceed 4 seconds	Requests for a new form were observed to take as long as 3 minutes and anecdotally were reported as high as seven minutes	Y
The computer should provide prompting, such as displaying advisory messages, to guide users in entering required data	MINMOD does not aid the user in selecting codes, outside of the user activated help screens	Y
Reference material should be available on-line to display system capabilities and procedures	This material is not available in MINMOD	Y
Novice users should be able to browse on-line HELP displays, just like a printed manual, to gain familiarity with system functions and operating procedures	MINMOD HELP is primarily a listing of codes and does not explain system functions or procedures	Y
Navigation actions should be consistent	The number of times "Go" has to be pushed (to move to the next screen) varies	Y
Cursor placement should facilitate data entry	On MCEI, goes down to where data entry begins, on another, toggles down to port and requires spacing before data entry	Y
Text should support full boolean searching, including the use of wild cards	MINMOD does not allow wild cards in name searches	Y
The program should not automatically end without giving the user a chance to save work	MINMOD does automatic logout without saving	Y
Data should only be have to be entered once	Information in MC does not fully map into MV - duplicate entry required	Y
Naming should be consistent	Resources on MCIR, PAIR, but MVCA instead of MVIR	Y

Appendix K

Acronyms and Abbreviations

Acronyms and Abbreviations

ALJ	Administrative Law Judge
ASIO	Assistant Senior Investigating Officer
ATON	Aids to Navigation
CO	Commanding Officer
Cont	control
COTP	Captain of the Port
CFR	Code of Federal Regulations
EF	equipment factor
FOIA	Freedom of Information Act
G-MIM	Commandant, Information Management Division
G-MMI	Commandant, Marine Investigation Division
GUI	graphical user interface
HCI	Human Computer Interface
HF	human factors
HQ	Headquarters
IAPR	Investigation Activity Preliminary Report
IASP	Status at Port (Port Log)
IO	Investigating Officer
LCI	Loss Control Institute
LOW	Letter of Warning
MC	Marine casualty
MCCG	Marine Casualty Collision, Grounding supplement
MCCR	Marine Casualty Case Recommendations
MCDD	Marine Casualty Description Details
MCDI	Marine Casualty Investigation Log
MCDR	Marine Casualty Deficiency Report
MCEI	Marine Casualty Entry Index
MCFC	Marine Casualty Flood, Capsize, Sinking supplement
MCFE	Marine Casualty Fire/Explosion supplement
MCHF	Marine Casualty Human Factors supplement
MCIR	Marine Causalty Investigation Report
MCLS	Marine Casualty Life Saving supplement
MCNS	Marine Casualty Narrative Supplement

MCPC	Marine Casualty Personnel Casualty supplement
MCSF	Marine Casualty Structural Failure supplement
MERMARPER	Merchant Mariner Personnel Record
MINMOD	Marine Investigations Module
MIO	Marine Inspection Office
MMD	Merchant Mariner Document
MRO	medical review officer
MSD	Marine Safety Detachment
MSIS	Marine Safety Information System
MSM	Marine Safety Manual
MSO	Marine Safety Office
MV	marine violation
MVCA	Marine Violation Case Action
MVCF	Marine Violation Case Formatter
MVCL	Marine Violation Charge Library
MVCR	Marine Violation Case Report
Nav	navigation
NEC	not elsewhere classified
OCMI	Officer in Charge, Marine Inspection
OJT	on-the-job training
PA	personnel action
PACA	Personnel Action Case Action
PAEI	Personnel Action Entry Index
PAIR	Personnel Action Investigation Report
PC	personal computer
REC	Regional Exam Centers
regs	regulations
RTC	Reserve Training Center
S&R	Suspension and Revocation
SCAT	Systematic Cause Analysis Technique
SIO	Senior Investigating Officer
Sit	situation
SSN	Social Security number
TQM	Total Quality Management
USC	United States Code
USCG	United States Coast Guard

VIN	vessel identification number
VTS	Vessel Traffic System
WX	weather